APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

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- HYDRAULIC CIRCUITS
- HYDRAULIC CONTROLS
- AIR CIRCUITS
- AIR CONTROLS
- ELECTRICAL AND ELECTRONIC CONTROLS

IN THIS ISSUE

SIMPLIFIED BUMPER ASSEMBLY

HOW 7 COMPANIES SAVE DOLLARS WITH AIR FILTERS

POST HOLES • • • QUICKER AND CHEAPER

TRIPLE ACTION ASSEMBLY FOR MOTOR STATORS

HOW WE REDESIGNED FOR MORE BROACH PRODUCTION

DESIGNING FOR MINIMUM SURGE

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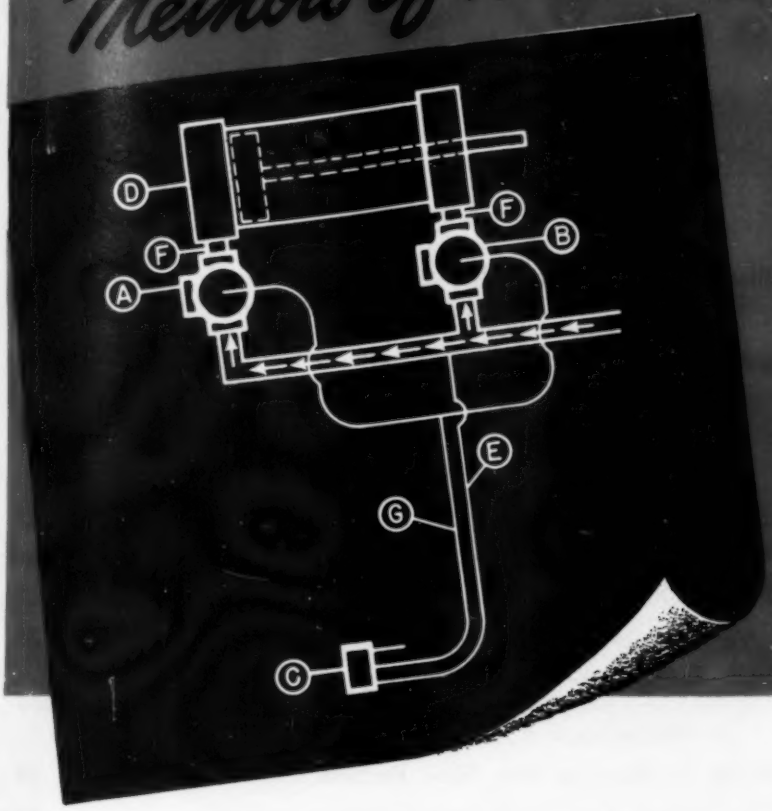

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DECEMBER, 1950
Vol. 3 No. 11

APPLIED HYDRAULICS

The Magazine of Fluid Power Transmission

IRVING P. HEXTER, Pres.
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Editorial and Business Office
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JEROME R. PESKIN
General Manager

PAUL L. REED
Editor

PAUL ROLNICK
Associate Editor

•

Production Department
WILLIAM L. JERSE

•

Circulation Department
E. M. JOSEPH
Director

•

NEW YORK OFFICE
STEPHEN SHEPARD
60 East 42nd Street
Room 805
New York 17, N. Y.
MUrray Hill 7-3420

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FRONT COVER: *Merry Christmas*

Contents

Simplified Bumper Assembly 21
The use of package hydraulic pressure generators to power three pairs of riveting cylinders to rivet bumper face bar assemblies.

BASIC HYDRAULICS SECTION

Directional Valves 23
Chapter VII, Part 6.

How 7 Companies Save Dollars with Air Filters 24
Seven procedures used by companies to reduce service and down-time, make operation safer and cut service calls.

Air Carries Oil Particles for Lubrication 25

How We Redesigned for More Broach Production 26
By W. T. McCormick
The steps in a rather simple solution to the problem of accelerating the main slide of a standard broach, increasing production.

Hydraulic Conference Sets New Record 28

J.I.C. Pneumatic Standards Reach Working Stage 31

Post Holes . . . Quicker and Cheaper 32
The application of oil power for positioning and feeding the boring tool of a truck mounted post hole digger.

Triple Action Assembly for Motor Stators 34
The hydraulic circuit of a triple action press which gave faster, more accurate compression of stator laminations and easier assembly of the frame.

AVIATION HYDRAULICS SECTION

Aircraft Committees Hold Semi-Annual Meeting 36

Designing for Minimum Surge 38
By Fred O. Hosterman
An analysis of pressure surges and a description of a new surge dampening device for protection of landing gear mechanism.

Departments

Letters to the Editor 8
Literature in This Month's Ads 16
Here's How 30
New Components 42
Useful Catalogs and Bulletins 48
Post Scripts of Industry 56
Market Place 58

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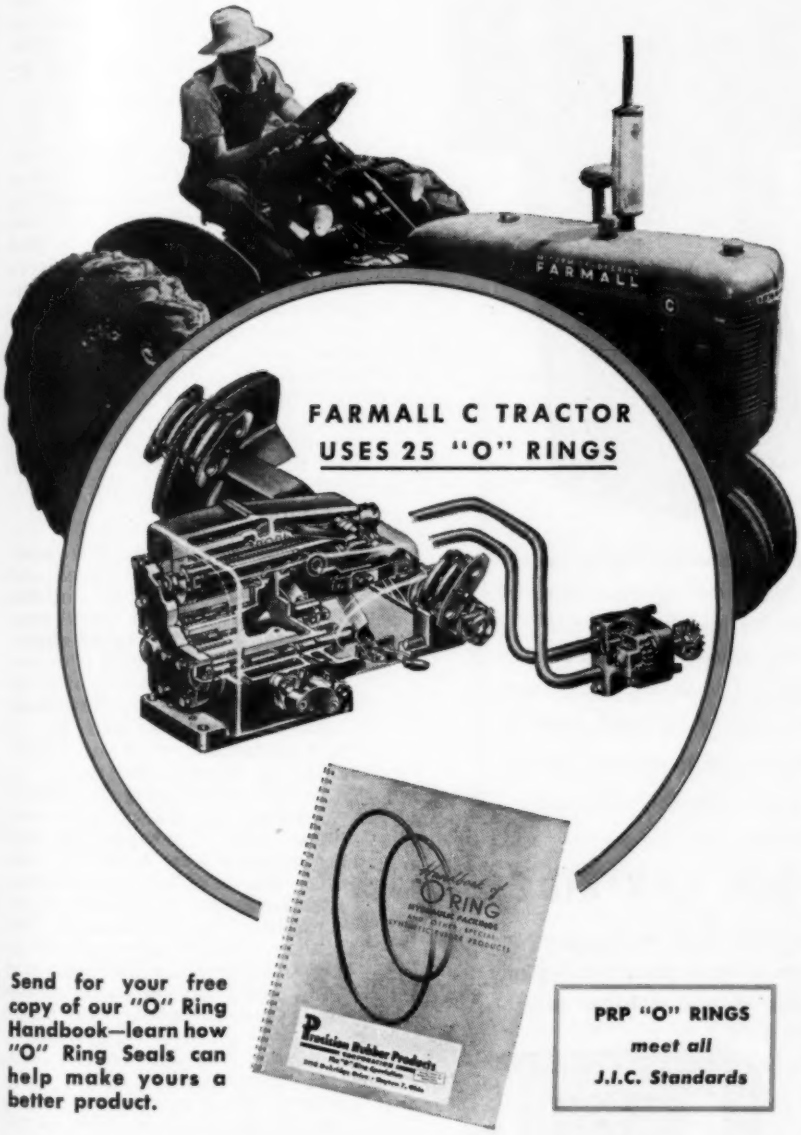

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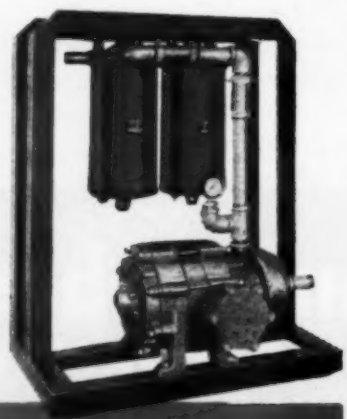

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LETTERS to the Editor

Can you tell us when the new J. I. C. Pneumatic Standards for Industrial Equipment goes into effect? Where can we secure a copy?

K. H.
B. V.

The J. I. C. Pneumatic Standards for Industrial Equipment have not as yet been published. After a special meeting (see news story elsewhere in this issue) in October, the Standards were ready for a first printing. It is expected that several major pneumatic equipment manufacturers and possibly one or more large users will print limited numbers for their customer and supplier groups. It cannot be stated now if a deadline for the use of the Standards will be set at the time of publication.

We are starting an educational course for our machinist and machine builder classifications covering the construction and trouble-shooting of pneumatic and hydraulic equipment. A copy of your Applied Hydraulics Data List would materially aid us in this undertaking. Your magazine has been very useful as a means of keeping in contact with the latest hydraulic and pneumatic developments. All the copies are kept on file with the articles cross-indexed. However, the June, September, November and December, 1948 copies are missing from our file. Is there any way we can acquire these copies to complete our files?

E.L.N.

We wish you the best of luck with your new training program. We have sent you two copies of the Data List as requested and are pleased that you have found APPLIED HYDRAUICS useful in your work. We are able to furnish two of the back issues you lack.

Please let us know if any university or technical institute is giving a correspondence course in applied hydraulics.

R. J. R.

As far as we know, no such course is offered. Courses on basic engineering background subjects are, of course, available. It is possible that you could work out a program for yourself from catalogs of one

(Continued on page 13)

(Continued from Page 8)

or more institutions. A good place to begin such a check is the list shown in the bulletin of the National Homestudy Council, 2601 Sixteenth St., Washington, D. C.

In the spite of the fact that we have tried to keep a complete set of copies of APPLIED HYDRAULICS we find several copies short in our files. We have copies of back issues except the following: April, 1948, February, April, May and June 1949. We have duplicate copies of January, April, May and June 1950 and would be glad to horse trade with other readers.

G. A. F.

We will be willing to act as intermediary for any of our readers who may wish to swap copies to help G.A.F. Our own supply of back issues is very incomplete and ordinarily we cannot undertake to supply copies older than three months.

The article "Emulsions as Hydraulic Fluids", published in the August issue also brought a number of letters to the editor. Two are excerpted below:

I would like to put the following questions to the authors of "Emulsions as Hydraulic Fluids":

(1) Is it not important to specify the hardness of the water so as not to add a water with a relatively high calcium content which can reverse the emulsion by precipitating the emulsifier as an insoluble soap?

(2) It has been our experience that in a lubricating system the presence of water has always been deleterious from the standpoint of sludge formation. Thus, as the oil begins to oxidize and form either soluble acids or insoluble pasty tars, these materials, due to their chemical nature are more apt to find their way to the water where they remain and in which they grow by coagulation. The water will discharge this material when it has grown sufficiently large, but by this time, these oxidation products are very close to their final form of hard, gritty sludge particles.

(3) Has any theory been reported as to the mechanism of lubrication of such a lubricant?

E. K.

While the findings are probable accurate as far as they go, neither the article nor Mr. Pritchard's comments adequately cover the situation. Much time and effort has been spent on this subject in the General Motors Shop Lubrication Committee and in Subcommittees of the Master Mechanics and Plant Engineers Committees, besides the Joint

GREER ACCUMULATOR
Increases Speed of Weld Roller
Cuts its Cost $100

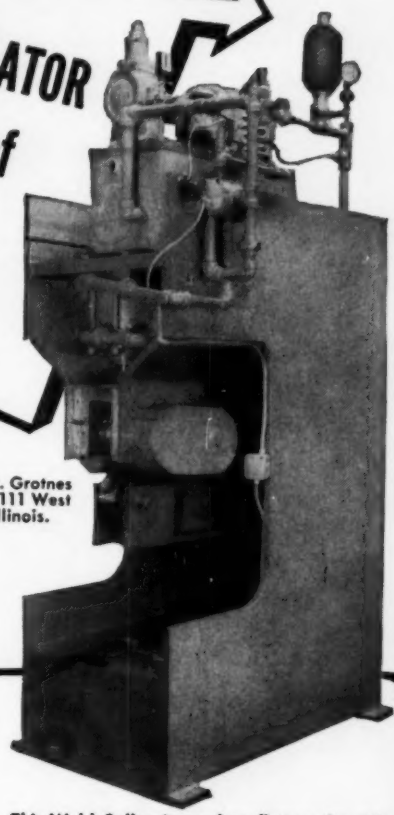

Photo courtesy of Chas. Grotnes Machine Works, Inc., 2111 West Lake Street, Chicago, Illinois.

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This Weld Roller is used to flatten the side seam on 55-gallon drums immediately after they have been flash welded and stripped. The results are said to be so satisfactory that after the drum has been painted it is almost impossible to find where the drum has been welded.

Mr. Charles Grotnes, Vice President of the Chas. Grotnes Machine Works, Inc., of Chicago, reports that by incorporating one Greer Accumulator on the Weld Roller illustrated above, it was possible to replace a large pump and motor with a much smaller power unit. This resulted in a saving of one-hundred dollars in the original cost of the roller.

In addition, the Accumulator provided a bonus feature consisting of an increase of 50 to 75% in speed on the return stroke.

This is but one of many applications where Greer Accumulators are playing an important role in improving efficiency and reducing cost of equipment and machines using hydraulic power.

If you are seeking ways of upping production and reducing cost, it will pay you to have full information on Greer Accumulators. Write today for your copy of our Accumulator Bulletin 300.

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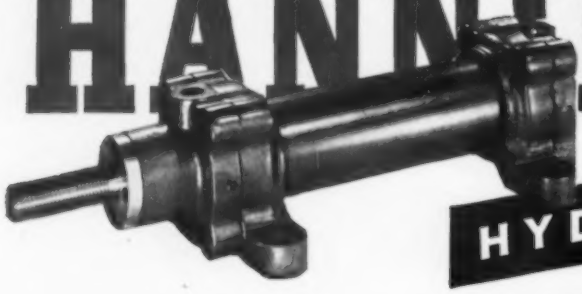

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HYDRAULIC CYLINDERS
Bulletin 110

ASK FOR BULLETINS

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CORPORATION
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AIR CYLINDERS
Bulletin 210

Industry Conference on Hydraulics. We feel constrained to protest that oil in water emulsions have been eminently successful in large installations of hydraulically actuated machinery and equipment over a long period of years.

A classic example is the excellent results achieved by Doehler - Jarvis Corporation with high production operation of die casting machinery. Their experience provides adequate evidence of the satisfaction and economy of the use of oil in water emulsions when properly engineered and applied. In addition, the two alternate hazards of flammability or toxicity have been entirely obviated.

Although some of the presently available hydraulic equipment has been designed for use with petroleum fluids and is dependent upon the relatively high lubricity of petroleum, all of the suppliers of hydraulic equipment have indicated not only willingness, but considerable interest in developing their equipment so that it will be suitable for use with non-flammable, non-toxic, low cost fluids. We can definitely forsee that not just a few hydraulic systems will be suitable for use with water base fluids, but that many will be developed so that they will be suitable, not only for use with petroleum, but with weak oil in water emulsions.

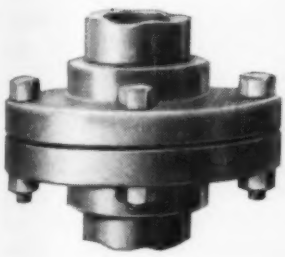
L. A. D.

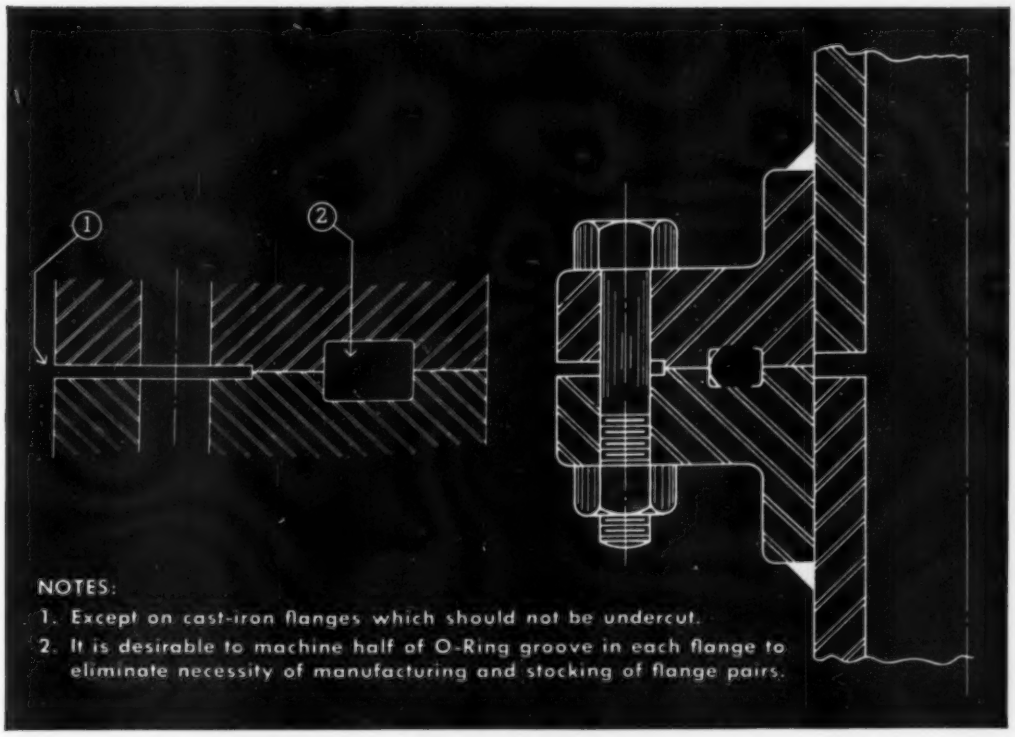
I am presently engaged in designing hydraulic cylinders, valves and pumps and would appreciate your advice regarding literature to assist me in my present work. Recently I have come across some issues of your publication and noticed a "Beginners' Course in Basic Hydraulics". I would be interested to find out whether this course can be obtained as a complete volume.

M. O.

We have written you regarding the original source of this series. However, the material is now somewhat obsolete and in our series we have made extensive changes, in some cases rewriting the individual installments completely. Since we are not able to furnish back issues except in scattered instances we believe it might be worth while for you to secure a copy of the original, provided you use it advisedly and utilize recent literature of manufacturers or consult with their representatives on specific problems.

We have had a number of letters from readers suggesting specific subjects or types of applications that they would like to see covered in APPLIED HYDRAULICS. We are always glad to get such suggestions.

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NOTES:
1. Except on cast-iron flanges which should not be undercut.
2. It is desirable to machine half of O-Ring groove in each flange to eliminate necessity of manufacturing and stocking of flange pairs.

TIP...

FOR THE DESIGNER

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ALDRICH PUMP COMPANY. Data sheet 64 presents details on the new direct flow pump.

Circle 16 on Reader Service Card

AMERICAN CRUCIBLE PRODUCTS CO. Literature describing parts made from Promet bronze can be had. Estimates will be made from blueprints and operating data.

Circle 52 on Reader Service Card

CHICAGO RAWHIDE MANUFACTURING COMPANY. Sirvis mechanical leather packings are described in a general catalog available from this company.

Circle 14 on Reader Service Card

THE COMMERCIAL SHEARING AND STAMPING CO. Catalogs are available describing Commercial's line of pumps, valves, and cylinders.

Circle 19 on Reader Service Card

EATON MANUFACTURING COMPANY. Illustrated literature on their rotor pumps is offered.

Circle 8 on Reader Service Card

GENERAL FILTERS, INC. Complete specifications on installation of General's wool cartridge filters will be supplied.

Circle 7 on Reader Service Card

GREEN, TWEED & CO. Complete details will be sent covering Palmetto Kups.

Circle 24 on Reader Service Card

C. B. HUNT & SON. Solenoid valves for operation up to 300 cpm at air pressures to 125 psi are described in available bulletins.

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LOGANSPORT MACHINE CO. Engineering service to solve your chucking problems is offered. Catalog 70, Section 1 describing air and hydraulic operated chucks can be had.

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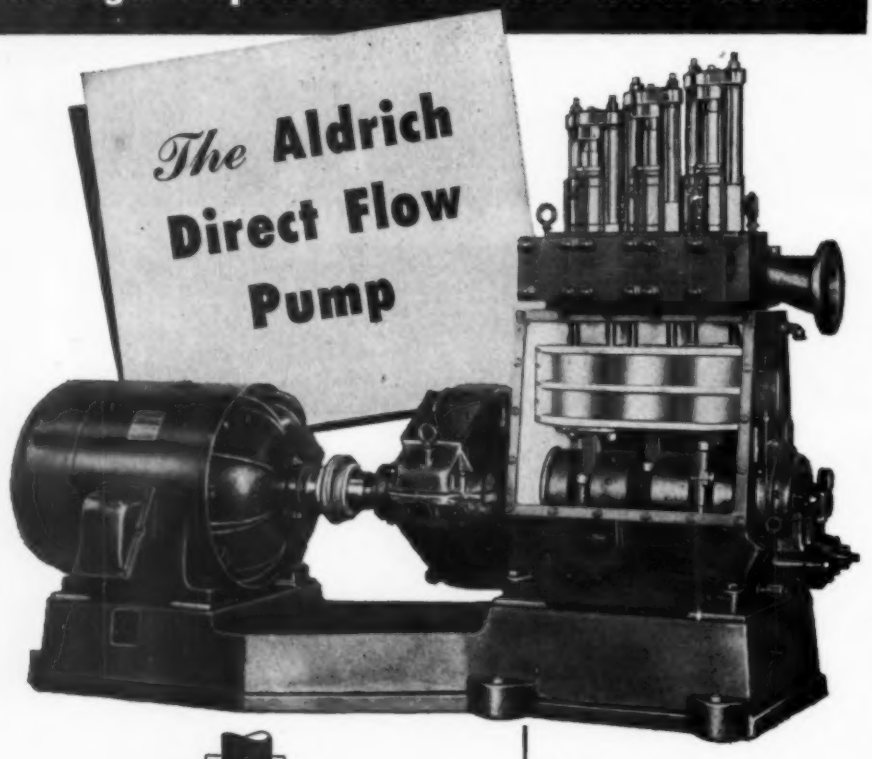

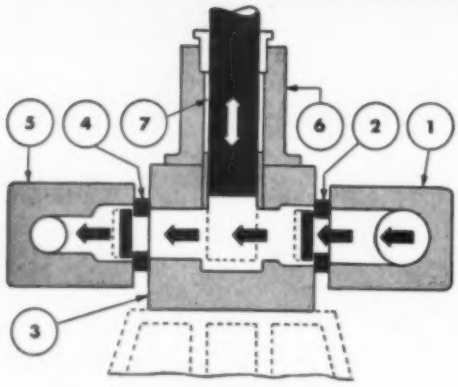

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(2) valve assembly,
(3) working barrel,
(4) valve assembly,
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(6) stuffing box,
(7) plunger.

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Circle 44 on Reader Service Card

W. H. NICHOLSON & CO. The complete line of valves for air and oil operation is displayed in catalog 546.

Circle 41 on Reader Service Card

OILGEAR COMPANY. Data is available to meet specific fluid power drive requirements for production equpiment.

Circle 3 on Reader Service Card

PLASTIC & RUBBER PRODUCTS CO. Catalog and engineering data on their line of "O" rings will be sent on request.

Circle 32 on Reader Service Card

PRECISION RUBBER PRODUCTS. A handbook of "O" ring hydraulic packing presents engineering and application data.

Circle 6 on Reader Service Card

STANDARD PRESSED STEEL CO. Full details are supplied in Bulletin 675 for the complete range of pressure plugs.

Circle 51 on Reader Service Card

SUN OIL COMPANY. For information about Sunvis H. D. 700 oils an illustrated booklet has been made available.

Circle 30 on Reader Service Card

WEGNER MACHINERY CORP. Engineering and application data on the new hydraulic transmission is offered.

Circle 53 on Reader Service Card

WESTERN FELT WORKS. New Acadia Packing Handbook gives facts about physical properties designs and applications.

Circle 28 on Reader Service Card

Circle 16 on Reader Service Card

SIMPLIFIED BUMPER ASSEMBLY

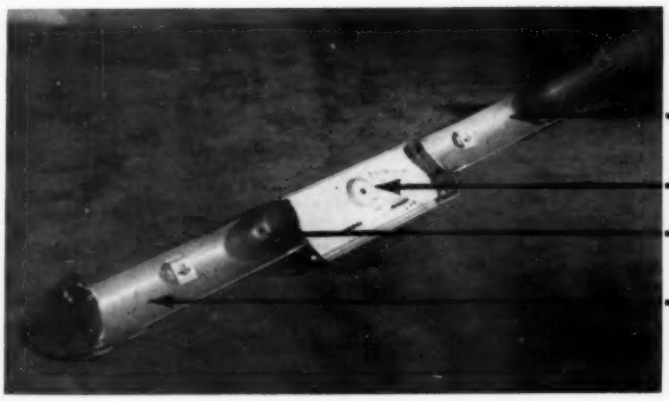
TWO COMPLETELY AUTOMATIC, HYDRAULICALLY powered and electric-controlled machines are used by the Standard Steel Spring Company of Corapolis, Pennsylvania to rivet bumper face bars assemblies for a leading automobile manufacturer.

The machines, designed and built by Bunell Machine & Tool Co., Cleveland, perform two sets of operations. The first machine rivets the center section to the carrying brackets. The second machine locates and rivets the center and carrying brackets to the two outer sections. Bumper face bars are completed at the rate of 300 per hour.

The second machine, in which three pairs of hydraulic riveting hammers cold squeeze the heads of six rivets, is described.

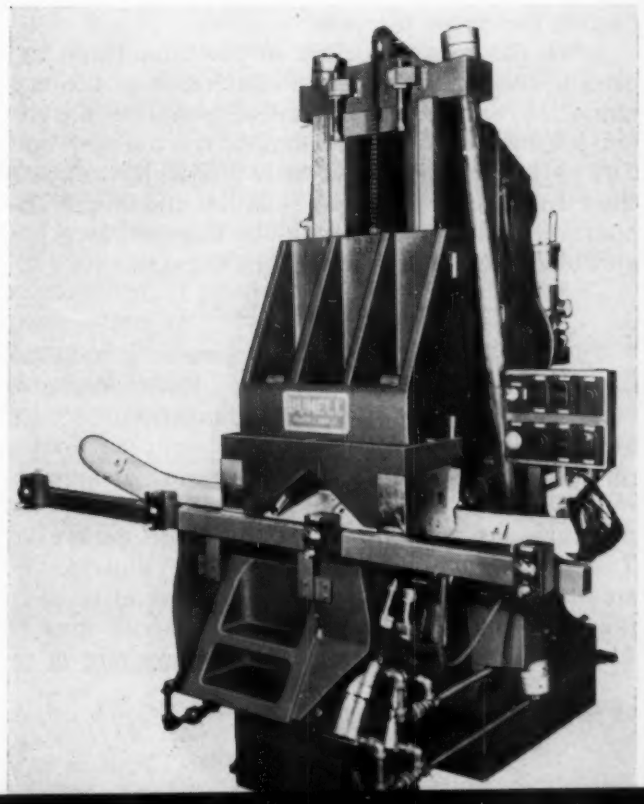
Operation

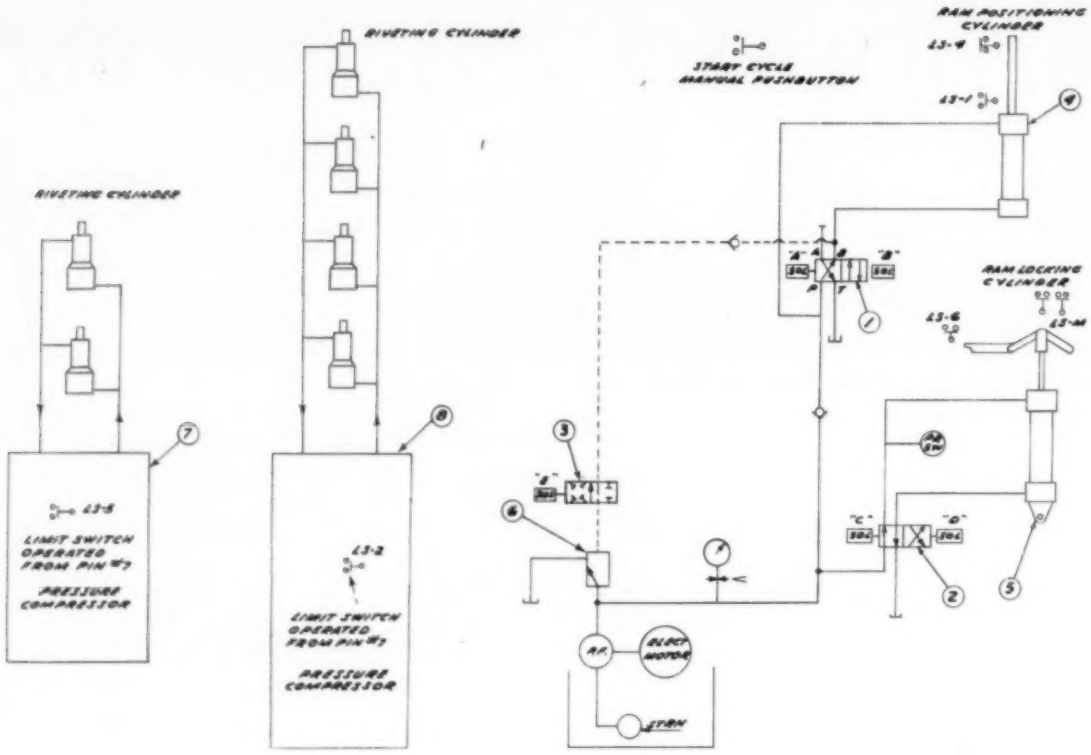
The operator places the center section and the two outer sections into the holding fixture on the machine, presses a button, causing the ram to move downward. Blocks on each side of the



THIS MACHINE USES *three pairs of hydraulic riveting hammers to cold squeeze rivets which fasten the two bumper outer sections to the carrying brackets. Previous to this operation, another machine rivets the center bar to the carrying brackets.*

Rigidly built the machine is controlled hydraulically and electrically. The electric control panel is equipped with an automatic start button which causes the machine to go through one complete cycle without stopping. There is a master stop button to stop the machine at any point of its cycle. The control panel is equipped with a series of start buttons, each of which manually control a certain motion of the machine.





lower face of the ram are shaped to fit the inner contour of the face bar and as the ram descends sections of each block are moved backward. When the stationary sections of the form blocks contact the lower contour of the face bar, the bar is held rigidly in the fixture and the form blocks act as a backup for the rivets. When the ram or saddle reaches a fully down position, a wedge is slid by hydraulic and toggle arm power into a recess in a steel plate attached to the back side of the ram, securely locking and holding the ram in the down position.

After the ram is locked in position, three hydraulic riveting cylinders on each side of the machine move in and cold squeeze heads on six rivets, joining the three sections of the bumper bar. The cylinders then move out, the wedge retracts the ram raises to its upper position and stops. The operator unloads the complete bumper face bar and loads new pieces for the next cycle.

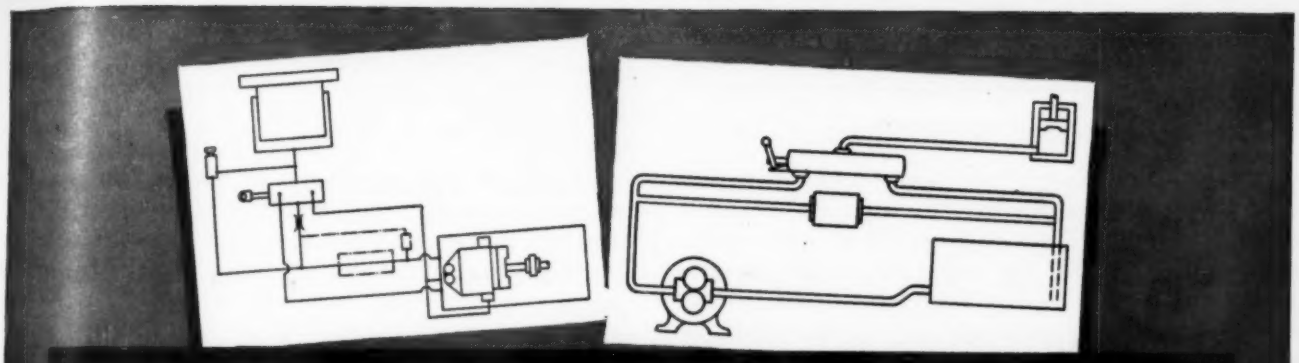
Hydraulic Circuit

Two package hydraulic pressure generators furnish the power for riveting. Each generator consists of a hydro-mechanical, multi-valve unit, electrically controlled; a direct-coupled motor pump unit to supply primary pressure at approximately 1000 psi and an intensifier to provide pressures up to 5000 psi. The large generator, 7, operates two pairs of riveting cylinders, the smaller, 8, operates one pair. Each rivet is ½ in diameter and requires a pressure of 35 tons to form the head, a total of 210 tons pressure is required for the six rivets. A fixed displacement pump furnishes power to operate cylinders to control ram and wedge movement.

January 1951 DIRECTORY ISSUE

You will want to use the Annual Directory Issue throughout the year. Giving you an up-to-date Buyer's Guide, the directory will include complete reference to sources of components for the design and manufacture of equipment using hydraulic and air circuits.

In normal automatic operation, the solenoid of four-way valve 1 is energized and pulls the ram downward. When the ram bottoms, solenoid of four-way valve 2 for the wedge cylinder is energized. Interlocks prevent operation of the generators until the wedge securely locks the ram down. Then the larger generator cycles automatically, squeezing four rivets, followed by a similar cycle by the smaller generator to squeeze the other two rivets. Then a timer relay breaks current to both the wedge down and ram down solenoids, the wedge is withdrawn from its locking recess in the wedge plate and the ram cylinder rises to its top position. A limit switch deenergizes the solenoid of shut-off valve 3 to vent relief valve 6 thereby removing the load on pump motor by allowing the pump to dump to tank through the relief valve.



A Beginner's Course in Basic Hydraulics

Chapter VII

DIRECTIONAL VALVES

Part 6

Methods of Operating Valves

VALVES ARE OPERATED MANually, mechanically, electrically or hydraulically, or by a combination of these methods. The mechanical - hydraulic combination is very common, e.g., oil pressure moves a part in one direction and spring pressure provides the counter movement.

Manual operation. Gate, globe and needle valves are almost invariably operated by hand. Many valves or valve parts are set by hand, as for example the pilot valve part of a compound relief valve, although the pilot valve itself works by a combination of mechanical and hydraulic means. Some directional valves are hand operated. The dials of a panel system are hand set.

Mechanical operation. The mechanical parts used may be pivots, levers, cams, gears, cranks, springs, etc. Gravity is also used to operate valves, e.g., many check valves which close by gravity. Many valves close by spring action, e.g, check valves and relief valves. Directional valves are often positioned by cams, gears, levers, etc.

Electrical operation. Pressure switches can be used to make or break a circuit at a given hydraulic pressure. The switches can be set in a number of ways, e.g., to reverse the action or start another process when the work has moved a definite distance, or when pressure has reached a certain level. A solenoid or electromagnet is often used to position a valve, especially spool type directional valves. When a current flows through the solenoid, a core to which the valve is physically attached is drawn into the unit. When the current is turned off, a spring or hydraulic pressure returns the valve to its former position.

Hydraulic operation. Check and relief valves open by means of hydraulic pressure. Directional valves may be positioned hydraulically. This means is always employed in operating pilot valves. Air pressure is used to work air vents.

The next installment will begin Chapter VIII, Introduction to Pumps. Questions for Chapter VII are on page 58.

It would be impractical for space reasons to give credit to all of the sources used in this series. However, these sources are covered in detail in the APPLIED HYDRAULICS DATA LIST, a revised edition of which is now available. Individual copies will be sent to readers on request. This list includes a selected group of manuals, brochures, texts, handbooks and catalogs of leading manufacturers in the hydraulics field.

DIRT and GRIT

Air operated equipment and tools demand clean air, free of moisture, for top performance and long service. The dirt, grit and pipe scale generally present in air lines can cause severe abrasive wear in equipment mechanism. And even though new pipe lines may be installed, it must be remembered that moisture in the air lines is constantly creating pipe scale through oxidation. This scale must be removed.

MOISTURE

Moisture, too, is present in all air lines unless elaborate and costly filtering equipment is installed. Water is forced from the air by the compression and expansion cycle to which the air is subjected. The total quantity of water in the air is dependent upon the relative humidity of incoming air and the quantity of air processed. If moisture reached the air equipment, it can cause destructive corrosion of internal parts.

How 7 Companies Save Dollars With Air Filters . . .

1 MORE PRODUCTION HOURS ADDED

Many production assembly lines using air operated riveting guns lose production time because of gun failure due to water in the air lines. Either production must wait while the guns are repaired or spare guns must be kept to fill in the line.

One company, the Sunlight Metal Products Co., Denver, had to tear down riveting guns three times a week because of water entering the guns through the air line. Since installing a filter-lubricator this maintenance work has been eliminated.

2 MAINTENANCE COSTS CUT 75 PERCENT

A large metal working plant installed a quantity of portable gun welding machines. These machines have valve controls and, in particular, welding cylinders varying in diameter from 1½ to 2½ in. with 1 in. stroke. They operate at speeds up to 200 strokes per minute. It is essential that clean air be delivered to these machines particularly prior to the lubricator for the cylinder. Prior to the installation of filters, considerable downtime occurred because of sticking valve or cylinders due to the presence of dirt and moisture from the air line system. It is estimated that maintenance costs have been reduced at least 75 percent since filters were installed which, of course, does not include additional savings due to reduced downtime of the machines.

Over 300 of these machines were installed in one plant alone and the investment required for filters in this particular instance ran something over $3,000. It is a safe statement that investments of this type are not made unless plant officials are satisfied that a need for air filtration equipment exists.

3 21½ MILLION TROUBLE-FREE CYCLES

As a typical example of how important air cleaning can be, here is the experience of the Victor Equipment Company of San Francisco, who use air valves in conjunction with a special drilling machine in the manufacture of welding tips. The air valves have functioned for an amazing number of cycles without any noticeable deterioration.

One unit after eighteen months of constant service has completed 21.5 million cycles. The original "O" rings are still in the valve. This was primarily due to the fact that the air line was properly engineered from the standpoint of elimination of moisture and foreign matter, and

with the addition of proper lubrication after the cleaning process was accomplished. This firm, very carefully puts their compressed air through an aftercooler to reduce the air temperature, after the compressing operation, to room temperature. This is extremely important especially where fluctuations of room temperature are encountered due to climatic conditions.

The airlines serving the air operated devices located in various parts of the plant, are fitted with drain traps which extend below the horizontal lines serving the pneumatically operated units. At the bottom end of these drain traps are pet cocks, and in some cases, automatic dumping arrangements whereby the accumulated moisture is eliminated. The horizontal lines serving the air operated devices are then purged at the work stations with a visible filter of standard manufacture to further purify the air and eliminate foreign matter. The air is then regulated for the particular job involved, and lubrication is admitted to the air stream with a standard adjustable lubricator.

4 REPAIR PARTS DOWN 90 PERCENT

A sales representative for a line of air tools estimate that at least 90 percent of the repairs returned to them are full of pipe rust and gummy deposits due to congealed water and oil. In other words, they estimate that 90 percent of the trouble with air line equipment can be eliminated with the application of proper filtration. They have generally been quite successful in promoting this idea and one plant which is following their recommendations now returns tools only for repairs due to worn parts.

5 SAFETY TO THE MACHINE OPERATOR

A stamping company using air clutches on their presses has air filters installed at each press for the protection of their equipment and operators. Clean air assures smooth operation of brake cylinder and valves — no parts will stick and cause the press to repeat with the possibility of serious accident.

6 LESS REJECTS ON PRODUCTION

Moisture in paint spray lines will cause specks and bubbles to appear in the finished product. On many cases this is not noted until the product is finished and then requires expensive reworking or refinishing.

A metal finishing concern has found that the use of air filters not only protect their spray guns, but save many dollars by protecting expensive finished products.

7 REDUCE SERVICE CALLS

One bus manufacturer uses compressed air for air brakes and for door closing and opening cylinders. They have made the statement that one service trip will more than cost the price of an air filter. Filters are installed in all their buses, at the outset, as standard equipment to prevent this type of difficulty.

Air Carries Oil Particles for Lubrication

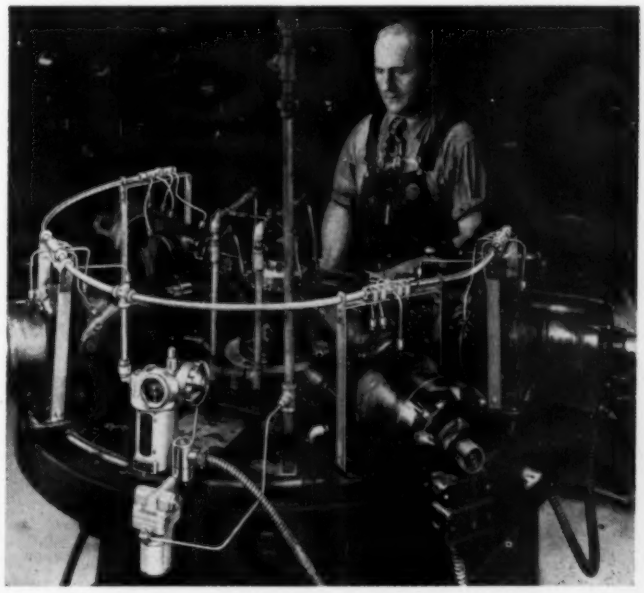
ALL BEARINGS ON THIS 4-HEAD KINGSBURY drilling machine are automatically lubricated by oil mist which is maintained by an air pressure of 10 psi.

High speeds and loads are encountered in this machine which turns out a piece part every second — 20 hours a day!

Into the bearing housings, twenty branch lines carry the flow of oil mist, which lubricates, cools and ventilates all of the bearing surfaces. Each bearing picks up only the amount of oil it requires for lubrication.

Bearings are lubricated and also kept free of contamination because the oil mist pressure in the bearing area is greater than the outside atmospheric pressure.

The lubricator in this system atomizes the lubricating oil into a mist by means of compressed air. An air pressure regulator and air gauge are integral parts of the lubricator.



How We Redesigned For More Broach Production

By W. T. McCORMICK

WE HAD A PROBLEM IN OUR SHOP WHICH required the reduction of time for an American broaching machine to complete its cycle. The machine, a type-10-36 (a ten-ton, 36 in stroke, three way broach) was practically identical with the machine of a competitive make, yet its daily output was far less. Our problem was to find the reason for the differential in production and to find a practical means of bringing production up to, or beyond the production of the companion machine.

As the first step, a time study was made of the cycles of the two machines. This study included each movement in the cycles; with and without loads; with minimum and maximum bleedoff. The cycles contained the same movements and the comparison revealed performances so nearly identical as to be accepted as such, except that the American broach required much more time to return its main slide. The main slide on both machines is used for pushing the broaching bar

(Continued on page 53)

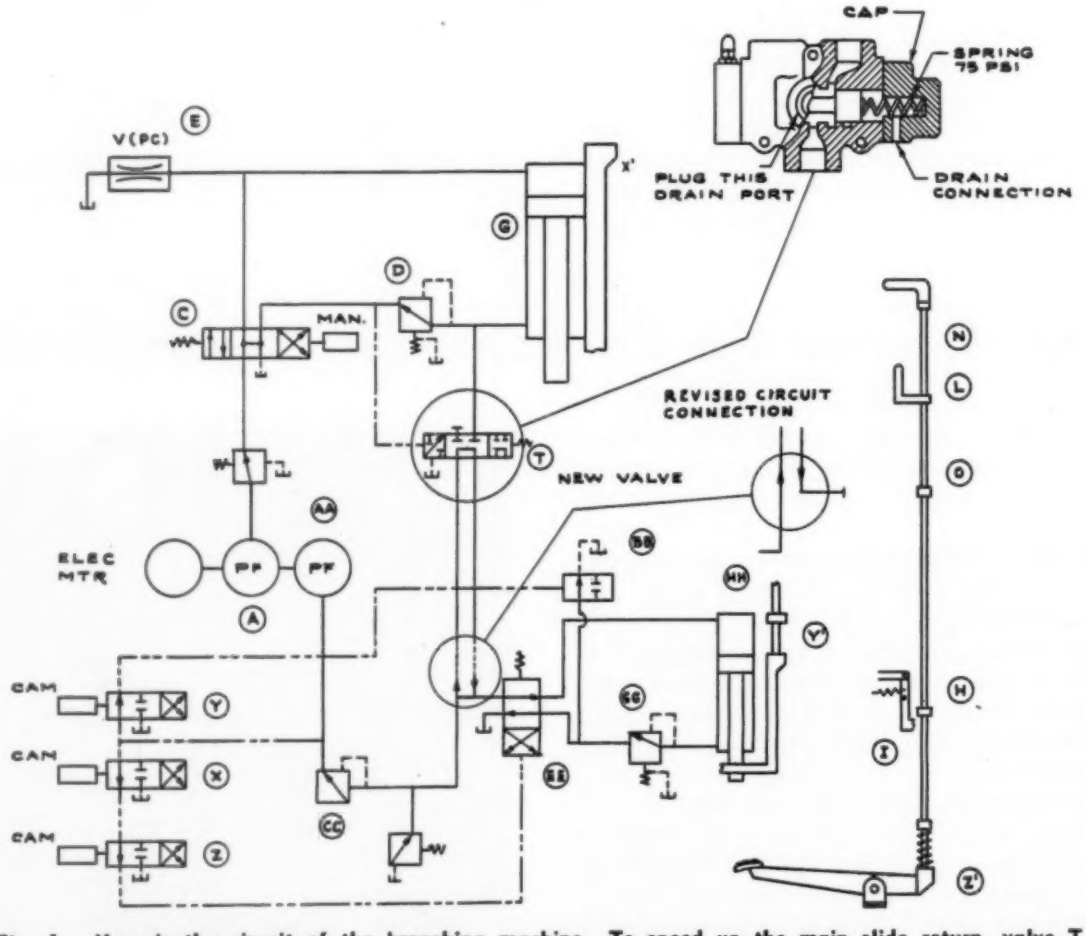


Fig. 1. Here is the circuit of the broaching machine. To speed up the main slide return, valve T was added permitting the volumes of both pumps to be combined in the fifth part of the cycle; the other four parts of the cycle function as in the original circuit without valve T.

Operation of the Broach Circuit

A step-by-step analysis of the original circuit without valve T:

1 Operator depresses foot pedal S, shifting main four-way directional control valve C to the forward or down position, allowing the volume of large pump A to flow to the head end of main cylinder G. Oil in the rod end of G must open foot valve D before it can pass through the return side of valve C to tank. The speed at which the main slide moves down is controlled by flow control valve E, through which a part of the available volume is bled off.

2 As main cylinder G reaches the end of its preselected stroke, adjustable stop X^1 depresses plunger in pilot four-way valve X; simultaneously arm L on main slide engages adjustable collar O, moving foot pedal S and control valve C to its neutral position, permitting the volume pump A to pass directly to tank. At the same time, foot valve D closes maintaining the position of the piston in cylinder G and the height of the main slide.

3 With the spool of pilot valve X depressed by cam X^1, pilot pressure, maintained by sequence valve CC, passes through the valve X and pilot valve Z (spool extended) shifts the spool in the pilot operated, spring offset, secondary four-way, directional control valve EE to its forward or down position. This allows volume of small pump AA to flow to the head end of secondary cylinder HH. Similarly to the primary circuit, oil in the rod side of cylinder HH must open a foot valve GG before it can pass through the return side of control valve EE to tank. As the slide propelled by secondary cylinder HH moves away from its upper position, latch I is allowed to move forward under collar H.

4 To reverse the secondary slide, the operator removes his foot from pedal S, permitting a spring to shift the valve linkage against latch I. This latch holds control valve C in neutral but permits cam Z^1 to depress plunger in pilot valve Z, blocking the pilot pressure and opening the pilot operated end of secondary control valve EE to tank. The spring of this valve shifts the spool to the return position, allowing the volume of small pump AA to pass through foot valve GG to the rod end of cylinder HH. Oil in the head end of this cylinder passes through the return side of control valve EE to tank. When secondary slide reaches its preselected height, adjustable collar Y^1 depresses plunger in pilot valve Y, allowing pilot pressure to open pilot-operated, two-way valve BB. With the latter valve open, the volume of small pump AA is passed to tank and foot valve GG closes maintaining the position of the piston in secondary cylinder HH and its slide.

5 As the secondary slide reaches the upper end of its stroke, latch I is opened, permitting spring tension to shift main control valve C to its return position. This permits the volume of large pump A to pass through foot valve D to the rod end of main cylinder G. Oil in the head end of the cylinder passes through the return side of main control valve C to tank. When the main slide reaches its preselected height, adjustable collar N and valve linkage are moved by arm L, shifting main control valve C to neutral. In this position the volume of large pump A is again passed directly to tank. With valve C in neutral position, foot valve D is allowed to close, maintaining the position of the piston in the main cylinder and the height of the main slide.

Adding Valve T Changes Step 5

The fifth portion of the cycle starts with the opening of latch I, allowing main control valve C to shift to the return position. As noted previously, the volume of large pump A passes through foot valve D to the rod side of main cylinder G. As soon as the resistance, due to the weight of the main slide assembly, reaches 75 psi in the return line, the newly installed pilot operated directional control valve T shifts, directing the volume of the small pump AA into the return line with that of large pump A. Then, as in the original cycle, when the main slide reaches its preselected height, collar N and linkage are moved by arm L until valve C shifts to neutral, passing volume of pump A directly to tank; valve D is allowed to close, maintaining the position of piston in cylinder G and the height of the main slide.

When foot valve D is closed, pressure in the return line between main valve V and foot valve D immediately drops below 75 psi, permitting the spring in the newly installed control valve T to shift the spool, directing the volume of small pump AA back into the secondary circuit; flow is through secondary control valve EE and two-way valve BB to tank. The circuit is now set to operate the same as the original for parts 1, 2, 3 and 4 of the cycle.

This valve reduced the time required for a complete cycle .08 minutes or about 5 seconds per cycle. In steady production and considering the number of cycles per hour and per day, this represented a substantial saving. This change, which incidentally permits the American broach to outproduce its competitor, was installed over two years ago and has given troublefree service.

Hydraulic Conference Sets New Record

THE SIXTH ANNUAL NATIONAL CONFERENCE ON Industrial Hydraulics which met on Wednesday and Thursday October 18 and 19 at the Sherman Hotel in Chicago set a new attendance record and a new standard of interest in what was considered the most successful meeting in this series. This conference, sponsored by Armour Research Foundation and the graduate school of Illinois Institute of Technology, has become the top annual technical session in the whole field of hydraulics. Over 400 persons were registered, the largest number to attend the conference to date.

Wednesday Sessions

Two new features were noteworthy in promoting attendance and in sustaining interest. One was the fact that sectional meetings were held; the other feature was the adoption of the panel discussion method in all of the technical sessions.

The opening session heard R. L. Smirl, Borg and Beck Div., Borg Warner Corp. on "Hydraulic Control Problems in Automatic Transmissions" and J. C. Van Gundy, The Texas Company on "Operation and Care of Hydraulic Machinery".

Aeronautical hydraulics was on the program for the first time as a formal subject of a technical session. This session, held Wednesday afternoon, heard Carl W. Chambers, Douglas Aircraft Company, Santa Monica, on "Aircraft Hydraulic Equipment Problems" and R. J. S. Piggott, Gulf Research and Development Company on "Cavitation in Reciprocating and Rotary Pumps". A lively discussion was developed in the panel after these papers were given.

Concurrent with the aeronautical papers, sessions were held on Centrifugal Pumps and on Chemical Engineering Hydraulics. Dr. A. J. Stepanoff, Ingersoll-Rand Company read a paper on "Volute vs. Diffusor Casings for Centrifugal Pumps" at the pump session, and the chemical engineering session heard "Fluidynamics of Bubble Trays" by Glen S. Houghland and Warren C. Schreiner, The M. W. Kellogg Company; and "Characteristics of Small Rotameters" by J. J. Moon, Phillips Petroleum Company.

Raymond D. Meade addressing a luncheon session on "Observations in Korea".

John P. Sanger, dinner speaker, whose subject was "The Findings of the Hoover Commission and What You Can Do About Them".

Dr. H. A. Leedy reviewed "Industrial Research in Latin America" for one of the luncheon meetings.

The panel at the aeronautical hydraulics technical session. Left to right: Carl W. Chambers, Harry P. Kupiec, J. T. Marshall, R. J. S. Piggott and moderator B. R. Teree.

Thursday Sessions

On Thursday morning technical sessions on Hydraulic Presses, Civil Engineering Hydraulics and on Hose and Fittings were held concurrently. The Press session heard John J. Littley, Baldwin Locomotive Works, on "Accumulator vs. Self-Contained Pumping Unit" and A. Zeitlin, Hydropress, Inc., on "Large Hydraulic Presses in Germany before and during World War II". The Civil Engineering session heard three papers: "Hydraulic Dredges" by J. E. Yager, Bucyrus-Erie Company; "Large Sewage Pumps" by H. T. Sward, Fairbanks, Morse and Company; and "Operating Experiences with High-Head Gates and Valves" by W. G. Weber, Bureau of Reclamation. The session on Hose and Fittings was addressed by D. F. Stranberg, Anchor Coupling Company, Inc., on "Hose Assemblies and Related Fittings" and by J. H. Swartz, Linear, Inc., on " 'O' and 'V' Ring Packings in the Industrial Hydraulic Field".

APPLIED HYDRAULICS plans to publish, in abridged form, several of the papers presented at the 1950 conference. Summaries of comments developed by the panel speakers will be included.

Three Concurrent Sessions

On Thursday afternoon three technical sessions concluded the two day program. Sessions on Agricultural Hydraulics, Refinery Hydraulics and on Control of Surges were held concurrently. The agricultural session heard a pair of well balanced papers: "Utility of Hydraulic Power in Farming with Wheel-Type Tractors" by J. F. Ziskal, International Harvester Company and "Utility of Hydraulic Power in Farming with Track-Laying Type Tractors" by F. P. Hanson, Caterpillar Tractor Company. The refinery hydraulic session heard E. F. Wright, Worthington Pump and Machinery Corporation on "New Developments in Reciprocating Power Pumps" and A. E. Harnsberger, Pure Oil Company on "Applications of Centrifugal Pumps". The session devoted to the control of surges heard J. H. Dawson on "The Desurger" and Lewis H. Kessler, Northwestern Technological Institute on "Mechanical-Pneumatic Shokstops—Their Place in Relief of Liquid Hammer".

Eight Sponsoring Societies

Luncheon meetings were held both days. On Wednesday, Dr. H. A. Leedy, Armour Research Foundation, spoke on "Industrial Research in Latin America"; on Thursday Raymond D. Meade, Director, Korea Technical Institute gave his "Observations in Korea". The dinner meeting on Wednesday heard John P. Sanger, U. S. Gypsum Company on "The Findings of the Hoover Commission and What You Can Do About Them".

The National Conference on Industrial Hydraulics has the active cooperation of the American Society of Lubricating Engineers and the Western Society of Engineers and the local sections of the American Society of Civil Engineers, American Society of Mechanical Engineers, Society of Automotive Engineers, American Institute of Chemical Engineers, Institute of Aeronautical Sciences and American Society of Agricultural Engineers.

Otto J. Maha, Hannifin Corporation, who acted as conference director, F. W. Edwards, Illinois Institute of Technology, who was conference secretary, the Board of Directors and the conference committee are to be congratulated on the fine job they did to make the sixth annual meeting of the National Conference on Industrial Hydraulics an outstanding success.

HERE'S HOW

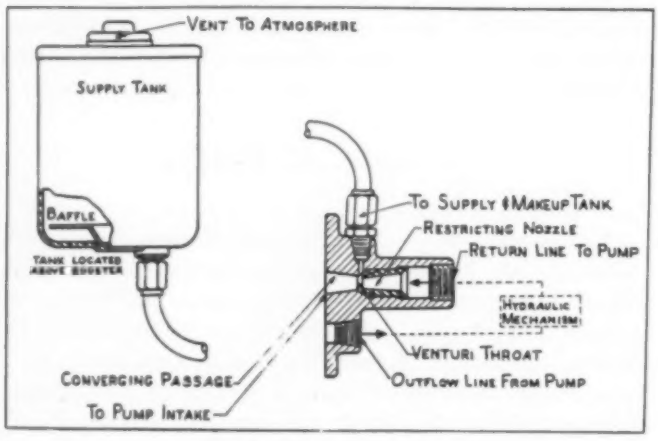
- PREVENTIVE MAINTENANCE
- SERVICE PROCEDURES
- MODERNIZATION
- SHORT CUTS

Cavitation Effect Minimized With Pump Booster

AN INPUT BOOSTER WITHOUT ANY MOVING PARTS provides a simple solution to the problem of pressure loss at high speeds in geared, rotary vane and certifugal pumps.

Practically any geared or vane type pump has a critical speed, above which the theoretical output exceeds the ability of the intake to supply the necessary liquid. When this speed is exceeded, cavitation occurs.

This cavitation effect causes a drop in output pressures, surges in flow, pump noise, and impeller or gear and bearing wear.

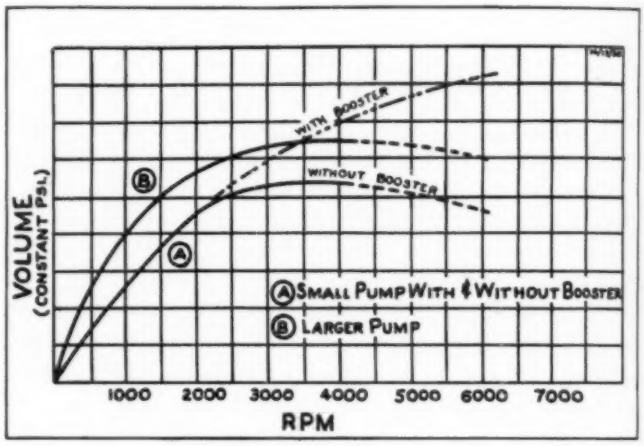


Booster Construction

The booster, by use of a simple venturi to automatically accelerate the input flow at high speeds, assures a steady input of solid fluid to the impeller and eliminates efficiency loss due to entrained air.

Basically the booster greatly increases the range of speed at which pumps can operate at or near peak efficiency. This means that in some cases smaller pumps, operating at higher top speeds can be used rather than large pumps. In other cases, the efficient speed range of a given pump can be extended to permit effective operation at higher driven speeds.

A typical problem solved by the booster was a geared pump installation for a power steering mechanism for automobiles. In order to supply the required minimum pressure at engine idling speed (about 500 rpm) the original pump had to be quite large. But the large pump provides much more volume than necessary at low speeds; and pressure could not be maintained due to cavitation at high engine speeds (about 3500 rpm) such as in low-gear operation of the car. Pump noise was very objectional and pressure surges made the operation of the power steering mechanism erratic.



Performance Tests

The problem was solved by use of a smaller pump plus a booster. To obtain the desired minimum pressure and volume at low engine speeds, the smaller pump was geared to operate at twice engine speed. The booster stretched the pump's efficient operating range to such an extent that cavitation had not begun at the engine's top operating speed. Comparative performance of the two pumps is illustrated.

F. W. DAVIS
Waltham, Massachusetts

In any high pressure line . . . be sure that enough flexibility is provided to allow for bends and twists without endangering the circuits. If rubber hose is used, make sure enough line is provided, as some types of hose shorten under pressure while others may lengthen under similar conditions.

Readers are invited to contribute their short cost and labor saving shop or plant ideas. Each contribution will be acknowledged and considered for publication. We will pay $5.00 for each item published.—Here's How Editor

Comments by P. B. Niland • • •

"These Standards, by being good engineering practice standards, rather than dimensional or material standards, point out a goal in regard to performance and service accessibility, which permits the manufacturer the full scope of his "know-how" and ingenuity in the design of his equipment. Many representatives of manufacturers of industrial equipment, that we have come into contact with, have stated that the standards have reduced considerably the amount of negotiation in obtaining an order."

J.I.C. Pneumatic Standards Reach Working Stage

OVER 130 ENGINEERS AND EXECUTIVES OF BOTH equipment builders and major users of pneumatic components and systems met at the Rouge Plant of the Ford Motor Company on September 21 and 22 for a thorough study of the Tentative J. I. C. Pneumatic Standards for Industrial Equipment, which had been presented at a meeting held on May 3 at the General Motors Building in Detroit. Agreement was reached, except for one provision on sealing devices for cylinders and valves, and approval was given to the Standards as amended.

The meeting was welcomed to the Ford Motor Company by P. B. Niland, who was introduced by D. P. Morell, supervisor of Standards and Construction Applications of the Rouge Plant.

R. L. Wilhite, Production Engineering Section, General Motors, chairmanned the meeting, assisted by Mr. Morell.

Each paragraph of the Tentative Standards were read, discussed and approved, amended or deleted, in each case as the representatives present unanimously agreed. The procedure followed that of other J. I. C. Standards meetings. The Hydraulic Standards were followed as closely as practicable.

The Tentative Pneumatic Standards, like the Hydraulic Standards, has an initial glossary and a section of general standards (AO). In the glossary, five definitions were revised, two added and two deleted. Two minor changes were agreed upon in the general section of eleven items.

The major body of the Pneumatic Standards is divided into six sections: Diagrams; Pneumatic Controls; Compressors; Piping, Fittings and Passages; Valves, Accessories and Devices; and Safety.

A1 Diagrams: The diagram section, like the comparable section of the Hydraulic Standards, outlines standards for circuit diagrams, standard symbols, a legend code (color code and pattern code) and definitions of functions. Only minor revisions or clarifications were suggested and agreed upon.

A2 Pneumatic Controls: Definitions are given for both manual and automatic controls. The tentative definitions were accepted. *Under-pressure* regulation was added to *over-pressure* protection as a requirement. In a sub-section on Circuit Controls, one paragraph suggesting "suitable dash-pot devices" to compensate for load variation was added and one paragraph specifying a limit of time variables in a cycle was omitted as not applicable to pneumatics. Only minor clarifying revisions were made in the Enclosure and Components and the Mounting sub-sections.

A3 Compressors: This section covers mounting standards and compressor name plates as was accepted with only one clarification on mounting to protect openings against entry of dust, dirt, chips, collant, etc.

A4 Piping, Fittings and Passages: Piping is defined to include all pipe, tubing, hose and fittings. Passages include all air conductors other than piping. A paragraph on the factor of safety for piping ("at least eight times normal working pressure") was revised to except flexible hose; and a recommendation that solderless pipe connectors be used was added and approved. Identification of Piping, listed as a sub-section, was approved with only the modification that "piping *and checking stations* shall be *permanently* identified to correspond with diagram markings".

A5 (future expansion).

A6 Valves, Accessories and Devices: This section is subdivided: (a) Filters and Lubricators; (b) Sealing Devices; (3) Cylinders and Pistons; (4) Valves; (5) Storage or Surge Tanks and; (6)

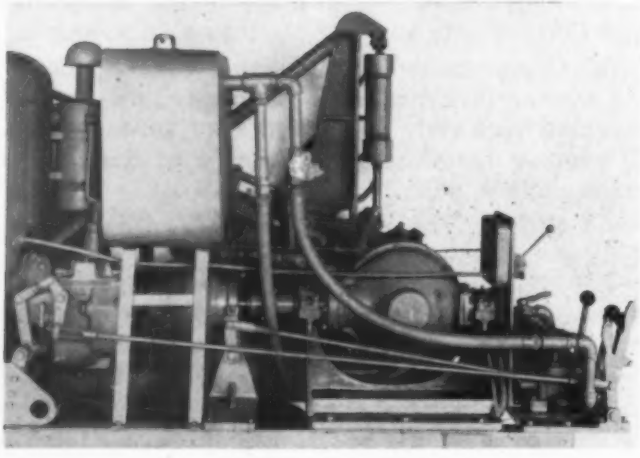
(Concluded on page 47)

Post Holes . . . Quicker and Cheaper

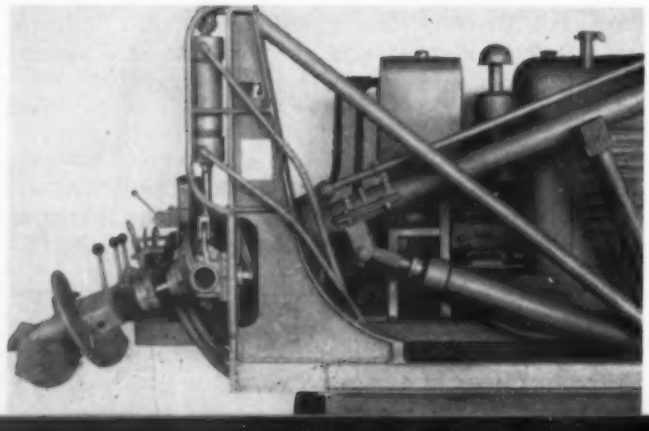
OIL POWER IS USED FOR POSITIONING AND FEEDing of the boring tool on this post hole digger which is produced by the Sterling Engineering and Manufacturing Company. An industrial type power plant, mounted on a skid platform has three engine speeds to power this earth boring machine. The first — an idling speed; the next — a digging speed; and the third a high speed to provide the necessary centrifugal force to throw the extracted earth from the auger when the auger is lifted above the ground. Attached to the transmission case of the engine is a power take-off driven hydraulic pump having a capacity of 30 gpm at 1000 psi.

The boring bar is completely enclosed in a hydraulic cylinder 3¾ in ID and at its upper end is fitted to a piston mounted on a pair of Timken roller bearings. The piston provides a potential thrust into the ground of 11,000 pounds. The right angle drives are mounted in steel trunnions which permit the boring bar to be lowered from the vertical to a near horizontal position for transporting over the road. Raising and lowering of the boring bar is accomplished with a second hydraulic cylinder, and a third hydraulic cylinder provides means for leveling the boring bar.

EARTH BORER IN ACTION Digging holes for power transmission lines, telephone lines and highway guard-rail posts can be efficiently performed at any angle from the vertical position. Hydraulic controls permit instant leveling and plumbing of the boring tool, regardless of the position of the truck on which it is mounted.

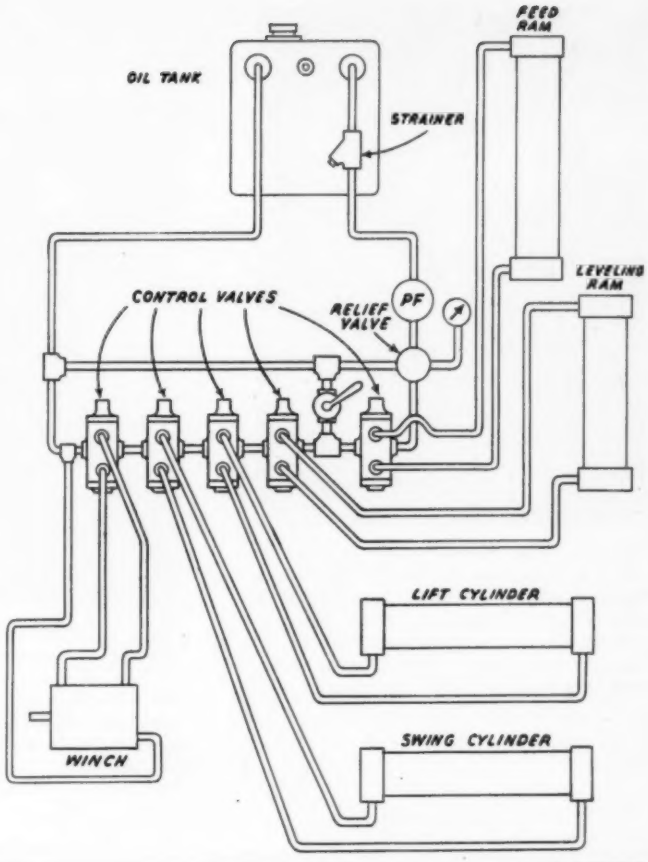


LEFT SIDE The three speed transmission, through the main output shaft and clutch, drives the right angle bevel gearing which transmits rotary motion to the cutting tool. The oil reservoir straddles the drive shaft. One outlet port is provided on this tank. The pump draws oil off the vertical leg of the tee through the hose on the left. Return oil is through the hose on the right of the tee. This circuit may be considered to be a closed system with the pump taking only make-up oil from the tank.

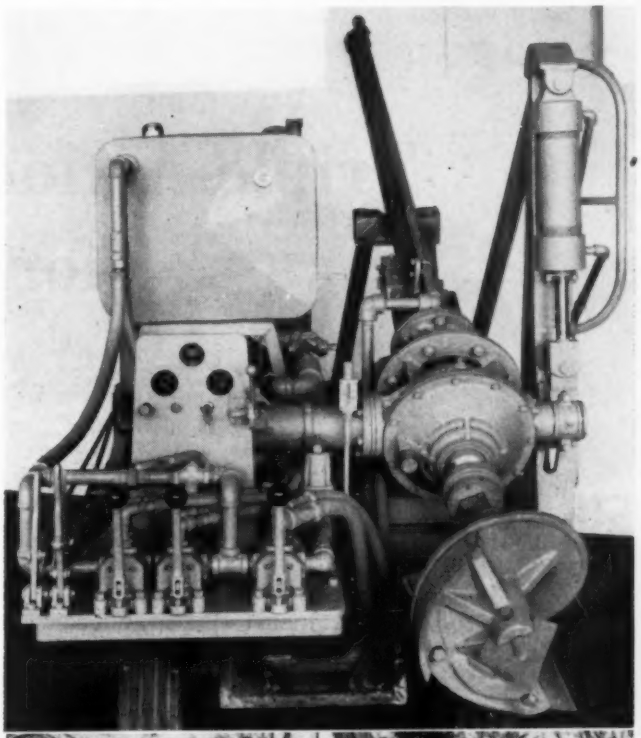


RIGHT SIDE Clearly shown here is the lift cylinder for raising and lowering the boring bar from horizontal transport to vertical dig positions. The main hydraulic feed cylinder which is the vertical extension of the boring bar provides the cutting thrust. Hinged ends on the leveling cylinder permit freedom at the mountings to plumb the tool. The pump is seen behind the lift cylinder driven by a take-off shaft.

HYDRAULIC CIRCUIT When a machine is equipped for swivel mounting and pole setting, the machine carries a set of five valves for operating various hydraulic cylinders. The first valve operates the main cylinder containing the boring bar and is so designed as to give a metering effect when first opened, thereby supplying slow feed for actual digging and fast feed for getting the auger into drilling position. On the reverse stroke of the auger, the loose earth is removed from the ground. In order to withdraw the boring bar rapidly from the deep hole, its movement is accelerated by oversized ports within the valve and higher engine speed controlled by a hand throttle located on the clutch lever. The second valve operates the raising and lowering of the main cylinder; the third operates the leveling of the main cylinder; the fourth valve operates the swivel mount; and the last valve, the hydraulic motor operating the winch.



FRONT VIEW OF TRAILER MOUNTED UNIT Three manually controlled valves direct oil to the lift, leveling and feed cylinders. The two handles on the left control the engine throttling and clutch. The boring tool, which is mechanically rotated through a right angle drive, is trunnioned for raising and lowering. The leveling cylinder is mounted above the trunnion at the right.



SWIVELING AND POLE SETTING In many cases, users will wish to drill from the side of the truck instead of the rear. To provide for this, the skid platform is swivel mounted and movement of the skid platform from either side of the truck is controlled by a fourth hydraulic cylinder. In cases where the equipment has extensive use on telephone or power lines, it is often desirable to use the equipment as a pole setting as well as an earth boring machine. To accomplish this, a rigid tube is superimposed over the main hydraulic cylinder which operates the boring bar. This tube is fitted with a suitable swivel pulley at the top. A winch is mounted on the main skid platform and is driven by a specially built hydraulic motor giving a lifting capacity of 2,000 pounds at the cable end.

Fig. 1. The motor frame is located on a fixture supported by the lower, upward-acting hydraulic ram. A steel end plate is dropped over an expanding mandrel which is actuated by an air cylinder inside the center plug. The laminations and the second end plate are then located.

Fig. 2. The expanding mandrel centers the laminations with the bore of the frome. The top ram applies 30 tons pressure to compact the laminations. Locking bars, grooved at each end to fit into the corner slots of the end plates, are driven into place.

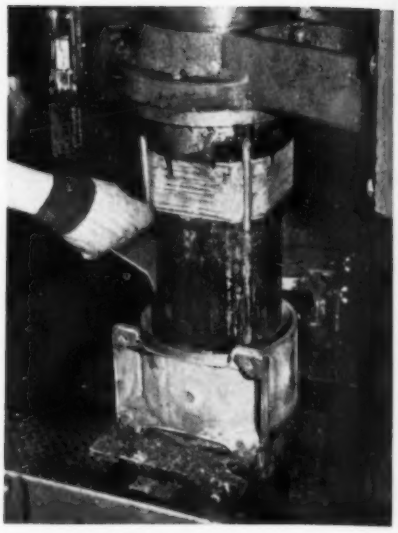


Fig. 3. While the top ram maintains pressure on the core assembly, The bottom ram is moved up to force the frame over the core. The operator holds a gage on the frame which contacts a limit switch mounted on the top ram. Actuation of this switch operates the solenoid valves to remove pressure from the cylinder.

Triple Action Assembly for Motor Stators

STATOR CORES AND WELDED STEEL FRAMES FOR Westinghouse Life-Line a.c. squirrel cage induction motors are assembled with a specially designed triple action hydraulic press. Figures 1, 2 and 3 follow the operation sequence as a motor is assembled.

The circuit is shown in Figure 4. An expanding mandrel, over which the core is located, is actuated, by the air cylinder. The 30 ton top cylinder compresses the stator laminations and the 15 ton bottom cylinder slides the frame over the core and ejects the finished unit.

When the press is idle, but with the pumps running, all solenoids are de-energized except "D" which is actuating control valve (1) to direct flow from the high pressure side of the combination pump to the tank by way of ports P to B, through the top ram and back through ports A to T. The low pressure side of the combination pump is unloaded and passes through the cooler to the tank. The pump supplying pilot pressure is bypassed through valve (1) to the tank. The top ram is up, the bottom ram is down and the air piston is up..

Pushbutton 1 energizes solenoids "C" and "A" moving the air piston and top ram down. With the laminations lined up and compressed, the operators inserts the locking bars, Figure 2. A second pushbutton deenergizes solenoid "A" moving valve (1) to neutral, thereby maintaining pressure on the top ram, and energizes solenoid "B" directing the flow through valve (2) to move the bottom ram up and push the stator in place, Figure 3. Pushbutton 3 energizes "D" moving the top ram up, and energizes "C" moving the air piston up. The bottom ram continues to move

up for ejection. After ejecting, pushbutton 4 de-energizes "B", the bottom ram returns, finishing the operating cycle.

The double high and low pressure combination gear pump is used to provide a rapid advance of the top cylinder. At low pressure, rapid travel, the pump delivers its full capacity advancing the top piston at 165 ipm. As the stator is contacted the increased pressure actuates a built-in unloading valve which by-passes the flow of the high volume side of the pump. The pressing operation is performed by the high pressure, small volume pump, moving the top piston at 40 ipm.

A small volume foot mounted pump delivering 1.1 gpm at 1000 psi provides the pilot pressure to the two solenoid operated, pilot controlled directional valves. This pilot pressure is directed through the relief valve for the pump.

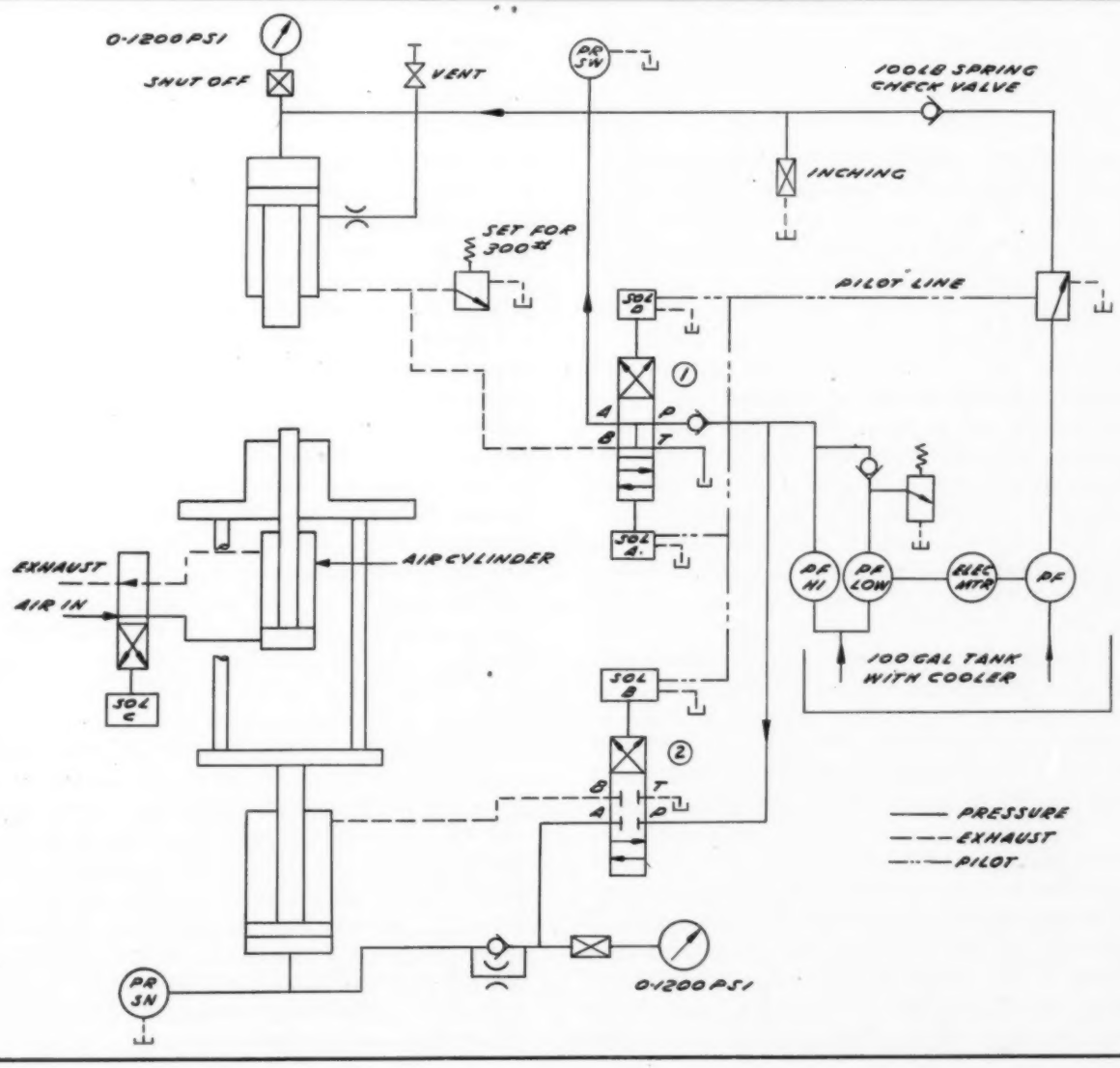
This small pump is included in the system to provide holding pressure for the top cylinder, independent of the main volume supplied by the combination pump. The use of the separate small volume pump for holding insures maintaining holding pressure on the top ram during the clamping cycle.

The relief valve in the return line on the top ram is set to by-pass flow to the tank at 300 psi, protecting the packings in the ram.

Spring setting of 100 pounds on the check valve in the top line to the ram assures 100 pound pressure in the pilot line which controls solenoid operated valves (1) and (2).

Hydraulic power readily performs this pressing operation, making it possible to properly time the action of three separate cylinders to produce the necessary force and travel to complete the work.

Fig. 4. The hydraulic circuit of the triple action press presents an application for a combination pump providing large volume flow for rapid advance and high pressure flow for the work stroke. A small volume pump offers additional holding pressure for the top ram and pilot pressure for the control valves.



FRED O. HOSTERMAN
Advisory Editor

SAE Aircraft Committees Hold Semi-Annual Meeting

APPROXIMATELY ONE HUNDRED HYDRAULIC ENGINEERS from industry and government were present when B. R. Teree of the New York Air Brake Company called to order the regular semi-annual meeting of SAE Committee A-6, Aircraft Hydraulic and Pneumatic Equipment, at the Hollywood Roosevelt Hotel, Hollyood, California on October 4th. The committee, guests and government representatives considered 35 agenda items during the regular three day session.

Aircraft Pneumatic Systems: Among the major items discussed was a thorough revision to specification AN-P-86, which is the general specification covering the design and installation of aircraft pneumatic systems. Previous to the meeting Arthur H. Hobelman of Walter Kidde & Co. and Wayne Boals of Hughes Aircraft had conducted extensive surveys through the accessory and airframe manufacturers to determine the desires of industry regarding needed revisions. These comments were then carefully reviewed by the assembled group and agreements were made for the final specification changes. Under the new procedure, these final recommendations of the committee will be subjected to one additional review by the industry before being submitted to the Aeronautical Standards Group.

Related to the same subject was the discussion of the need for a more comprehensive compilation of data on the characteristics of dry air and nitrogen over the wide range of temperature and pressure encountered in aircraft use. R. E. Middleton of Lockheed Aircraft distributed a summary of the data which he had collected, pointing out that a great deal of data still had to be collected, particularly at pressures up to 5000 psi and at temperatures down to minus 200 F.

Cylindrical Accumulators: The subject of cylindrical accumulators came up for further action. The envelope drawing had been revised somewhat since the previous meeting to meet the needs of the accumulator manufacturers; these revisions were discussed and given final approval by the committee. There was considerable discussion on the gunfire resistance of such units and the necessary tests for demonstrating such resistance. Since this problem is primarily one for a military decision, this was referred to the Service representatives with the request that they obtain the advice of their experts on this subject.

J. W. Kelly of Adel Precision Products reviewed the problems involved on preparing a suitable drawing and specification for flow regulator valves. It was difficult from the survey to determine whether these units should be of the fixed or adjustable type. After a lively discussion, the committee agreed that the fixed flow type should be used. Further discussion was concerned with the proper flow settings for the various sizes. Mr. Kelly will write the specification for review at the next meeting.

The A-6 SAE Committee on Aircraft Hydraulic and Pneumatic Equipment takes a break to be photographed. Chairman Teree led the group through a very full agenda of 35 items during the three day semi-annual meeting.

E. M. Polk of Air Materiel Command reported on the developments resulting from the change in the base polymer used for the manufacture of AN-P-79 packings. While he indicated that a slight change in compounding would be necessary from all sources, he expressed the belief that the ultimate result would be a packing that is easier to process and that would give results equal, if not superior, to present packings. The packing manufacturers indicated that these new packings would probably swell less in Hydrolube fluids than the present types.

C. E. Deardorff of Bendix Aviation, Pacific Division, reported on the results of his survey to determine the allowable surface finish of "O" ring grooves. This survey was made after several accessory manufacturers had indicated their conviction that the present surface finish requirements were unduly severe. Generally, the aircraft representatives wished to retain the present requirements; the accessory people wanted them relaxed. Mr. Polk of AMC was assigned the task of studying this problem in the light of service experience and he will report at the next meeting. His study is to include not only the surface finish requirements, but also the allowable tolerances for the "O" ring groove dimensions.

The hydraulic reservoir specification, MIL-R-5520 (formerly AN-R-7), was discussed, the objective being to bring it up to date. Specific points, including the filling requirements and the vibration tests, were discussed. It was felt that the filling requirements should be related to the size of the reservoir rather than to have a fixed value for all sizes. This would permit keeping a minimum size of opening in the filler screen and still allow a satisfactory filling time, even at low temperatures. Aircraft representatives were asked to send their comments to John Bloom of Douglas Aircraft, El Segundo Plant, so that he could summarize them and prepare a proposed revision for the next meeting.

Two Items on Hydraulic Brakes

Two items on the agenda involved hydraulic brake systems. These were specification AN-B-2a, the general brake system requirements, and MIL-V-5525, covering power brake valves. Neither of these specifications has been revised for some years and both are obsolescent. It was pointed out that these two specifications, being closely related, should be revised together and that some related paragraphs in the wheel and brake specification would also have to be revised. After discussion of many of the controversial points, Chairman Teree appointed a committee under C. E. Deardorff to make proposals for revision of the three related documnts. It was proposed to circulate the proposed revisions for industry comment prior to the next meeting.

J. W. Kelly presented a proposed specification for the solenoid portion of solenoid operated hydraulic and pneumatic valves. This specification had been circulated for industry comments and the committee reviewed the controversial points as revealed by this survey. Considerable discussion centered around the minimum voltage requirements under fixed temperature and pressure conditions. The aircraft manufacturers were insistent that a satisfactory margin of safety be provided; however, it was held important that this margin be held to a reasonable value to conserve weight. A final recommendation was agreed upon and this change will be made in the specification, which will then be circulated for final approval.

The next meeting of the A-6 Committee was announced for Dayton, Ohio for April 1951, the exact dates of which will be announced later.

Notes on the SAE A-1 and A-3 meetings will be found on pages 60 and 61.

Control of TIME is the most important element in the elimination or minimization of hydraulic system surges. Control of time may be taken care of in regulating the speed of actuation of the control valve, or, in some cases, by tailoring the modulation characteristics of the valve. In either case, the change in velocity with respect to time is the prime consideration.

Designing For Minimum Surge

By FRED O. HOSTERMAN

Hydraulic Design Specialist
Lockheed Aircraft Corporation

PRESSURE SURGES HAVE LONG BEEN RECOGNIZED as one of the most destructive forces encountered in hydraulic system operation. These surges, which have frequently caused peak pressures in excess of 200% of the nominal maximum, have caused early failures of packings, breakage of springs, and fatigue failures of tubing and valve housings. Failures of this type were not always attributed to the pressure surges, because the pressure peaks were frequently of such short duration that the commonly used Bourdon tube gages would not indicate the true magnitude of the maximum pressure. It was not until the development of electrical measuring equipment that the true pressure could be recorded and the cause for these failures became more apparent.

Mr. Hosterman introduces the subject of "Pressure Surges". Other articles by engineers who are working on this problem will be presented as additional data becomes available. The next article will present the practical application of electronic testing equipment for measuring surges.

In recent years there has been a more concerted drive to eliminate or at least to limit the magnitude of these peak pressures. In aircraft systems, the Military Services led the way by placing a limitation on such peaks in Specification AN-H-2 (now superseded by MIL-H-5440), which is the general specification for the design and installation of aircraft hydraulic systems. This specification further required that the prototype system for each airplane design be tested with electronic equipment to insure that the peak pressures would not exceed the allowable value. This figure has been revised in light of further experience, and is currently specified as 135% of the design system pressure.

In order to design a system for the minimum surge value, it is first necessary to understand the origin and causes of the surge. Most designers recognize the source of the trouble. Surges may originate from the operation of pump unloading valves, from the opening or closing of any quick-operating valve, or from the recoil of any mechanism which has been highly loaded by the hydraulic unit and which returns its energy into the hydraulic system when the pressure is suddenly released.

These are only a few of the points of origin, but a study will indicate that in the majority of cases the surge may be traced to the rapid starting or stopping of a fluid mass which has sufficient inertia or kinetic energy to cause the excessive pressure.

From the analytical standpoint, this may easily be seen from the following basic physical formulae:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\text{Force} = \text{Mass} \times \text{Acceleration}$$

$$\text{Acceleration} = \frac{\text{Velocity}}{\text{Time}}$$

$$\text{Combining,} \quad \text{Pressure} = \frac{\text{Mass x Velocity}}{\text{Area x Time}}$$

Thus it is seen that for a given set of conditions, which will establish the velocity, mass, and area, a decrease in TIME will cause an increase in acceleration which will in turn cause an increase in the force and the pressure required to start or stop th mass of fluid. If these were the only factors involved, the actual peak pressures could be calculated. Actually, the acceleration is affected not only by time but by the design of the valve as well, and other considerations such as the bulk modulus of the fluid-tubing combination further complicate any accurate calculations.

A further indication of the effect of time was demonstrated by some tests conducted by the Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio, and reported in their Memorandum Report No. MCREXA6-45254-3-1, "Solenoid Operated Hydraulic Directional Control Valve Tests". In these tests, a setup as shown in Figure 1 was used in which it was possible to control the speed of opening of a solenoid valve by means of a variable orifice damping cylinder attached to the valve plunger. Measurements of the valve operating time and the peak pressure at the cylinder inlet port were measured with electrical equipment and recorded on a multi-channel oscillograph. Some of the results are tabulated in Table I.

It should be noted that the peak pressures recorded in the table are the peaks of the first pressure wave. In the cases where these values are less than the operating pressure, the next waves showed a gradually increasing pressure until the operating level was reached. It should also be pointed out that the actual values represent only this one configuration and, while other configurations would be expected to show a similar pattern, the actual surge values might vary considerably.

TABLE I

Time for Complete Valve Travel (Sec.)	Piston Operating Pressure PSI	Peak Pressure PSI
.118	2000	1350
.075	2000	1625
.047	2000	2850
.028	2000	3400
.022	2000	3450
.021	2000	3500
.018	2000	3800
.015	2000	4100

A study of these test results lends vivid support to the theory that time is one of the primary elements which must be controlled in the elimination of surge. On the basis of these data alone, one might draw the conclusion that to maintain the hydraulic system within the necessary limits, it is merely necessary to operate the control valves at a speed low enough to reduce the peak pressures to the desired level.

Unfortunately, the solution is not always so simple. In the first place, the control of valve speed places definite limitations on the utility of the hydraulic system and the services which it can perform. In the case of power operated surface controls and similar servo-type mechanisms, maxmum speed of control valve movement may be necessary or extremely desirable. There will also be many instances where the surge is not dependent on valve speed within any practical limits, and thus must be controlled by other means, or by devices closer to the source of the surge.

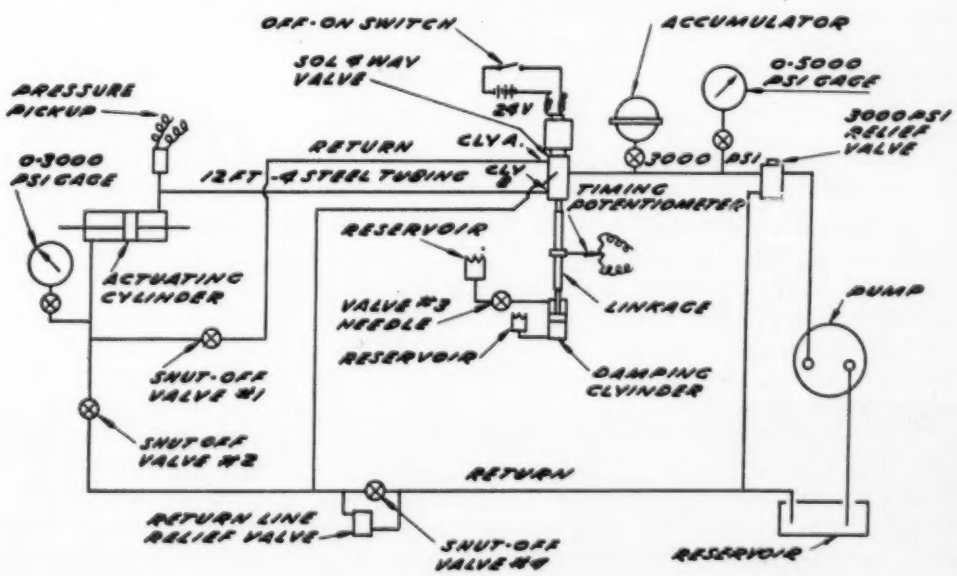
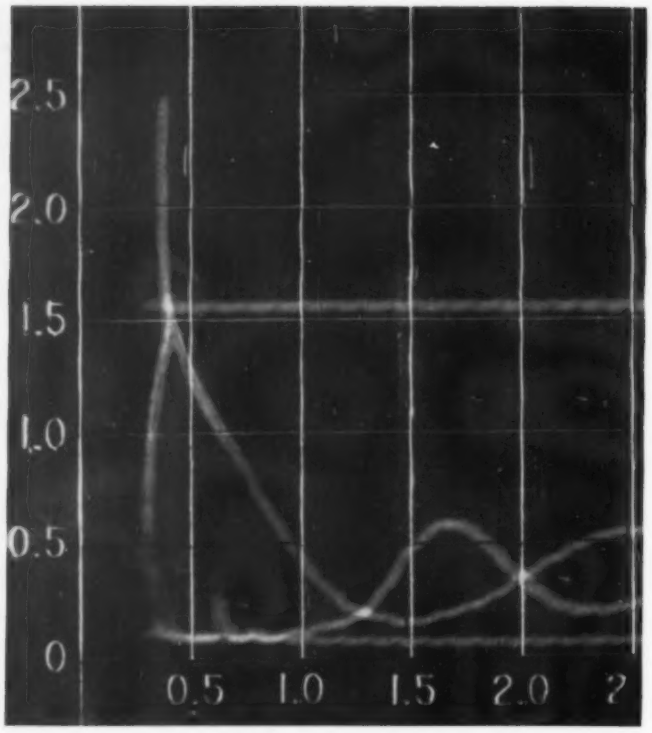


Fig. 1. The damping cylinder attached to the valve plunger controls the speed for opening the solenoid valve. Measurements of valve operating time and peak pressures at the cylinder inlet port indicate that surge pressures are reduced as the operating time is increased.



Figs. 2 and 3. On a landing gear retracting mechanism, surge pressures of 2500 psi were recorded on the oscilloscope. This high surge was sufficient to release the gear uplock. To reduce this high surge, a small surge damping device, shown be'ow, was placed in the circuit. The recorded lower trace shows an initial peak pressure of 300 psi followed by a gradual build up to 550 psi. Energy absorption is spread over a larger period of time. Horizontal traces are the calibration lines for 0 and 1500 psi.

Courtesy Denison Engineering Co.

Recalling the fundamental formula, it will again be noted that time is the only variable that can usually be controlled since the mass, velocity, and area are normally dictated by other considerations. There are, however, ways of increasing the time for acceleration of the fluid mass without increasing the valve operating time and suffering the attendant loss in performance. One such means is the use of an accumulator. In this case the accumulator can be used to absorb a certain portion of the instantaneous flow and distribute it over a longer time interval while the mechanism is operated at the desired rate. This method of reducing surge may be made quite effective in many cases by proper proportioning of the accumulator volume and the initial air charge. It has the obvious disadvantage, however, of an appreciable weight increase and hence will seldom be desirable unless all other methods fail. Likewise, the tube diameter may be increased in order to reduce the velocity, but again at the expense of weight.

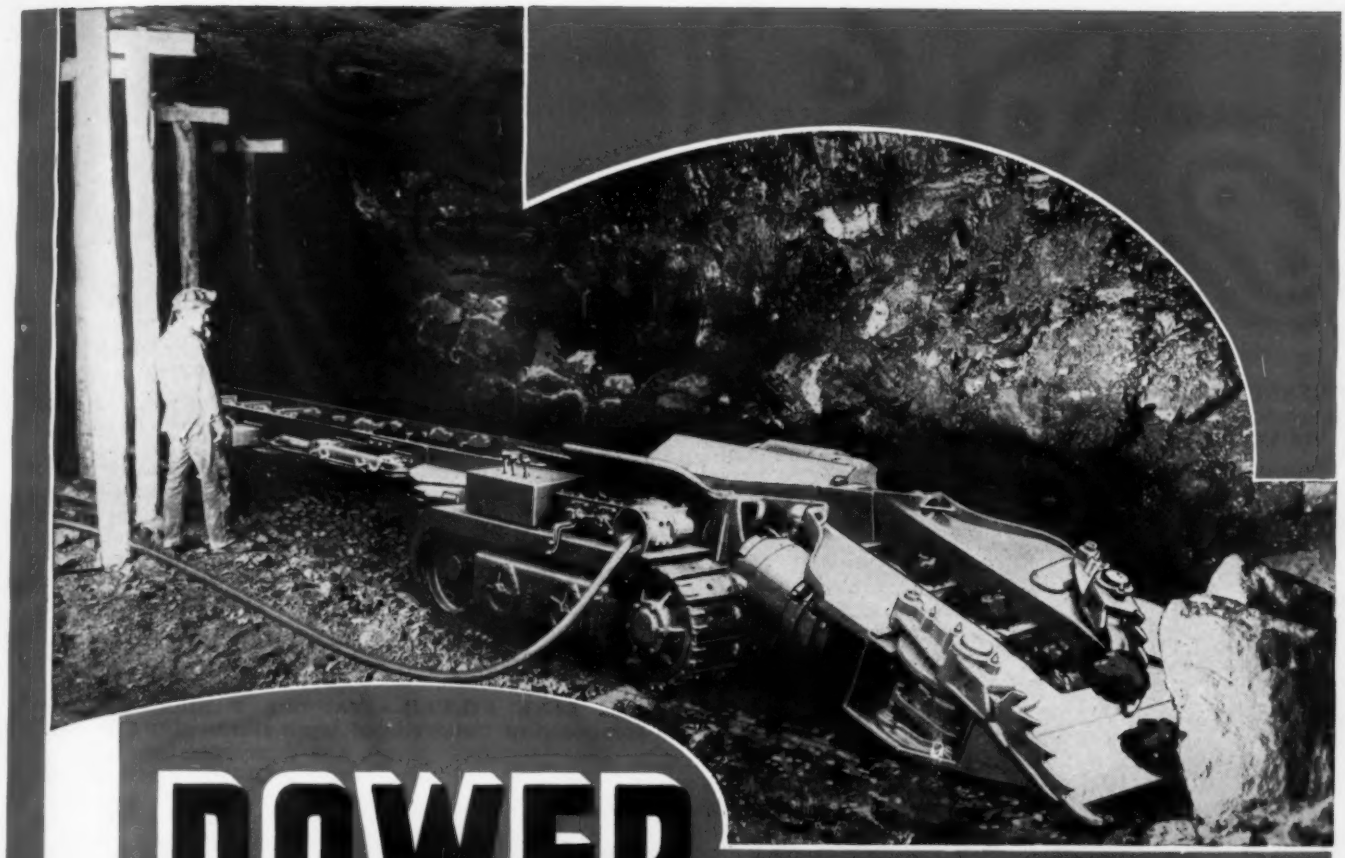
Small Device Damps Surges

A more practical approach for the average installation is the use of a surge damping device. One such unit now being manufactured has been tested and has been found to be vary effective within its range of usefulness. A typical application for such a unit and the results obtained is described below.

This application involving a landing gear retracting mechanism is which the control valve was returned to neutral after the gear was retracted and the cylinder ports were vented to return in the neutral position. When the landing gear was retracted, the hydraulic cylinder imposed a high load and some deflection on the actuating mechanism and the surrounding structure. Upon return of the valve to the neutral position, this deflection was relaxed and became translated to a certain amount of return movement of the actuating cylinder, thus causing some fluid to be forced back through the "gear up" line at high velocity. The attendant surge was sufficient to release the gear uplock and the gear was allowed to extend. Figure 2 shows the trace of this surge as recorded by electronic means, and will be noted to approximate 2500 psi. A surge damper was then installed in the "gear up" line and the lower trace shown in Figure 2 was recorded. This shows the initial peak pressure to be only 300 psi followed by a gradual build-up to 550 psi and clearly indicates that the energy absorption was spread over a longer period of time.

This surge damping device still uses time for opening as the key to its success. Nevertheless, its operation is so rapid that for most applications this slight increase in time would be of little or no consequence. What is probably more important to its success is the manner in which it permits a smooth increase in flow rate, thus limiting the rate of change of acceleration and the attendant shock, vibration, and surge.

This latter method can often be resorted to in the design of the control valve itself, thus eliminating the need for an additional unit to perform this function. Experience in the design of surface control boost valves has shown the absolute necessity for such design in order to eliminate surges and shock waves which would induce chatter or other forms of instability.



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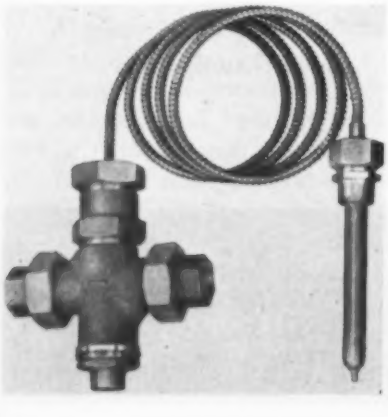
PRESSURE GAGE—The Clapp Instrument Company announces the new Solid Front ACRAGAGE—a solid front type of gage case incorporating a solid cast web backing up the dial, with the entire back of the gage case covered by a waterproof blow-out disc with bonded Buna N seal. This type of construction has two important advantages which are considerable increase in safety to operating personnel, and greatly increased ease of maintenance. The new ACRAGAGE is available in a full range of sizes from 4½ in through 10 in, in both surface mounting and flush mounting designs. It is available with all types of bourdon tubes, for ranges from 30 in vacuum to 80,000 pounds pressure.

Circle 101 on Reader Service Card

MULTIPLE FEED OILER — New automatic solenoid or manual control multiple feed oiler provides a centralized system of lubricating 1 to 20 bearing points on machine tools. Manufactured by Trico Fuse Mfg. Co. the unit feeds oil by gravity from a large reservoir through individually adjustable needle valves and through copper or neoprene tubing to the various bearings. When the solenoid, located directly below the reservoir, is energized, oil feeds to all lines. Feeding stops when current is shut off. Solenoids are of standard voltage. The complete solenoid type oiler with six outlets measures only 6 in. wide by 9⅞ in. high.

Circle 102 on Reader Service Card

TEMPERATURE CONTROL VALVE—Applicable to any process involving heating or cooling by means of water, oil or other fluids the improved "Sterlco Series 150E" temperature control valve manufactured by Sterling, Inc. is an entirely self-contained unit consisting of a compact, sturdy bellows-packed valve with stainless steel trim and monel bellows, a capillary tube, and a thermostat bulb. The flow through the valve is automatically modulated in accordance with the temperature at the bulb. Constant temperature can be maintained at all times. Built in two styles: direct-acting (valve closes as bulb temperature rises) for heating, and reverse-acting (valve opens as bulb temperature rises) for cooling.



A typical application in the plastics industry is on oil cooling heat exchangers on injection molding machines. The reverse valve controls the flow of cooling water through the heat exchanger, while the bulb is located in the hydraulic oil sump. Oil temperature is constant at all times. Water flow is limited only to that which is necessary for cooling.

Circle 103 on Reader Service Card

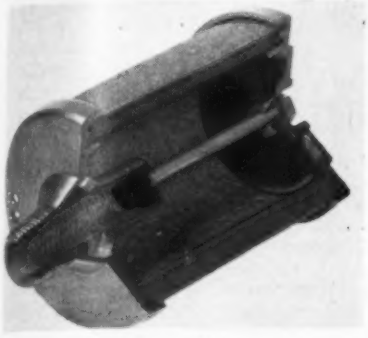
AIR LINE FILTER—Featuring a filtering element composed of hundreds of laminations of a fine, newly developed material, A. Schrader's Son Division has brought out a new Air Line Filter 3084. The filtering area is large enough to assure full air flow even after long periods of use. Moisture that is trapped, can be removed through a handy drain cock. This filter is available in three standard pipe sizes — ¼, ⅜ and ½ in. Pipe connections are the straight in-line type. When placed in the air-line ahead of any air control mechanism or air operated tools, it protects them by removing rust, dirt and moisture from the line.

Circle 104 on Reader Service Card

TEFLON PACKING — All the advantages of Teflon in convenient braided packing form are provided by Palmetto Teflon Impregnated Packing, developed by Greene, Tweed & Co. Palmetto 1330, as it has been designated, is prepared from chemically pure blue asbestos yarn, each strand of which is thoroughly impregnated with Teflon by the same unique impregnating process employed in manufacture of all Palmetto Self-Lubricating Packings. The Palmetto 1330 is equipped with Teflon's full resistance to acids, alkalis, corrosive chemicals and solvents, from -150 F to 550 F. Further, the yarn is then braided, braid over braid to avoid leakage through the crossection, and finished to present a Teflon protected packing built for assured high resistance to chemical attack.

Circle 105 on Reader Service Card

AIR EXHAUST MUFFLER—Manufactured by Allied Witan Company, this air exhaust muffler efficiently eliminates concussion that accompanies the discharge of compressed air. The noises that ordinarily accompany the release of compressed air are dispersed. The muffler is constructed in such a manner that there is no direct bursting flow of the discharged air into the atmosphere, it is impossible for the operator to be injured by the flying pipe scale particles that accumulate in the air lines. The air entering the ATOMUFFLER from the exhaust port of an air mechanism is designed to follow a definite pattern within the enclosed expansion chamber. The energy of the compressed air is utilized to create renitent sound waves, equalizing the concussion of opposing sound. The air then traveling through the fiberous disseminator emerges into the atmosphere in a series of radial planes, which completely eliminates the bursting blast of the released compressed air.

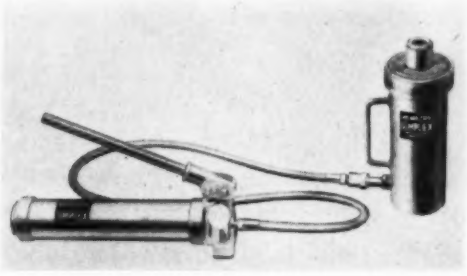


Circle 106 on Reader Service Card

TEFLON GASKETS—Introduction of an extensive new line of gaskets fabricated from "Teflon" is announced by Chicago Gasket Company. For industrial uses, teflon is fabricated in many different forms including both solid and jacketed gaskets. Of particular interest is the "Korda-Clad" jacketed gaskets. Several new features are incorporatd into this gasket including a seamless, one-piece, precision-machined jacket of pure Teflon assuring a perfect seal and heavier wall of Teflon on the inside diameter of the gasket. Available in hard, medium and soft grades they are suitable for all metal and non-metallic flanges, and are produced in all sizes from ½ to 6 in ID inclusive for ASA or special flanges.

Circle 107 on Reader Service Card

REMOTE CONTROL RAMS—A complete new line of remote control hydraulic rams and pumps has been announced by Templeton, Kenly and Company of Chicago. Named RE-MO-TROL, the units have been developed to operate where limited space makes the use of self-contained jacks impossible. Light weight and easy portability increase the safety and efficiency of many jacking jobs.



The RE-MO-TROL enables the operator to lift, pull or push from a distance and in any direction—up, down, sideways or at an angle. Rams will be available in seven models, including a telescoping ram, ranging from 10 to 100 ton capacities. The pumps operate at a maximum of 10,000 psi with overload safety protection.

Circle 108 on Reader Service Card

* Fluid Power Improves Production

"LOGAN"

AIR AND HYDRAULIC POWER-OPERATED CHUCKS

...WITH OPEN OR CLOSED CENTER

*FREE ENGINEERING SERVICE

Our engineers will solve your chucking problems with Logan special chucks, mandrels and collet chucks. No obligation.

• 32 years' engineering know-how • Completely equipped plant • Satisfaction assured • Complete range of standard types • Extra factors of strength and durability • Accurate, dependable service.

For your complete air and hydraulic chucking systems, Logan offers an extensive line of rotating cylinders, control valves, accessories, hydraulic power units and Collet Grip tube fittings.

Logan SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

FREE CATALOGS

Write for catalog No. 70, Section 1, on Logan air and hydraulic-operated chucks; catalogs Nos. 90 and 91 on air valves and cylinders.

LOGANSPORT MACHINE CO., INC. 832 Center Ave Logansport, Indiana

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS

FLUID POWER SPECIALISTS SINCE 1916

Circle 21 on Reader Service Card

Protect HYDRAULIC EQUIPMENT

WITH HIGH PRESSURE

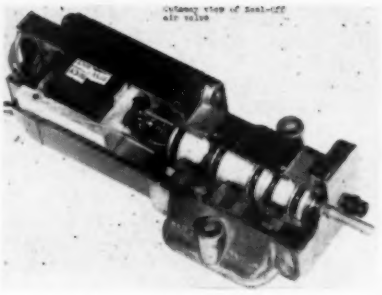
MICRONIC FILTERS

• 3000 p.s.i. Operating Pressure, Micronic Filtration, Low Pressure differential, Compact in Line Type

• Maximum Protection at minimum cost. Replaceable element.

West Coast: H. E. Webb
918 N. Kenilworth Ave., Glendale, Calif.

WATERMAN ENGINEERING Company
721 CUSTER AVENUE • EVANSTON, ILLINOIS

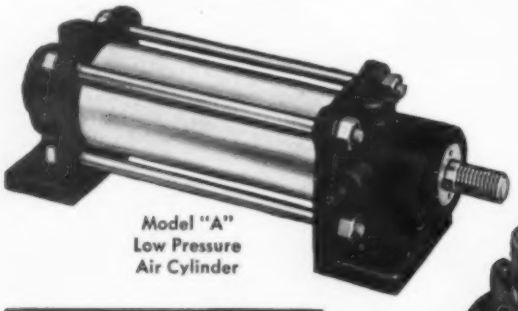


SOLENOID OPERATED AIR VALVE—Designed and manufactured by The Taylor-Winfield Corporation, the "Seal-Off" solenoid operated, pilot type air valves have corrosion resistant, non-ferrous valve body, anodized aluminum spool carried on standard "O" rings and hardened and ground pilot valve components. Large, carefully streamlined air passages provide greater flow capacity. Additional efficency and fast, accurate operation are gained by short air passages between pilot valve and valve spool, accomplished by compact "in line" design. A minimum number of parts is used for a maximum number of usable combinations.

Circle 109 on Reader Service Card

ROTARY ACTUATOR—Airborne Accessories Corporation announces their Models R-430 and R-440 "ROTORette" which are adaptable to valve operation and similar applications. Weighing approximately one pound, these actuators feature load-limiting switches which may be adjusted to any valve up to 50 pound-inches. The motion between travel limits is controlled by adjustable positive stops which cause a reaction on the load limit switches. R-440 is similar to R-430 except provisions are made for a position-indicating potentiometer or intermediate position switch. Both units are among the most compact aircraft actuators meeting all AN requirements.

Circle 110 on Reader Service Card



Model "A"
Low Pressure
Air Cylinder

Series 15
High Pressure
Hydraulic

For further information and data on NOPAK Cylinders and Valves, refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

Standard
Heavy Duty

Dependable Cylinder Power by NOPAK

For simplified machine movements . . . for pulling, pushing, lifting, clamping . . . with power range from Low Pressure Air to High Pressure Hydraulic . . . there's a NOPAK Cylinder to meet your needs.

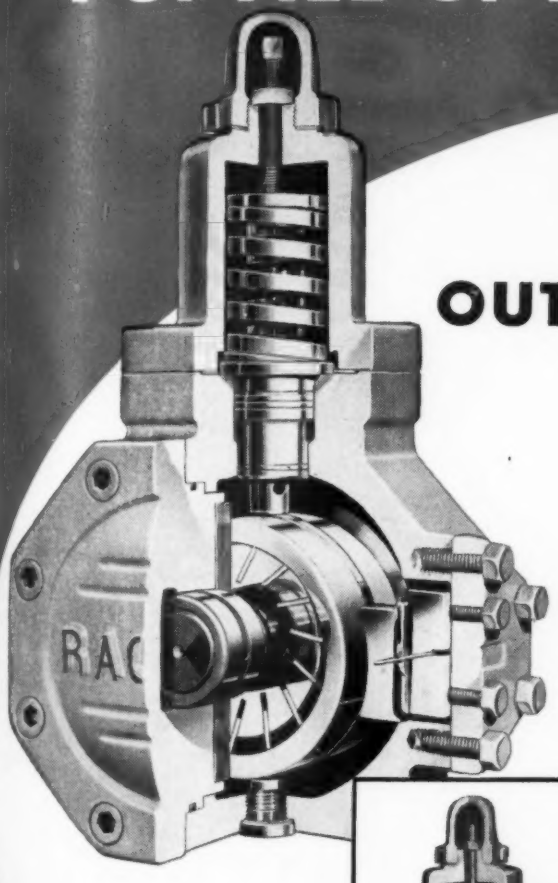
NOPAK Cylinders are available in 4 different classes of construction . . . to meet varied service requirements and to accommodate line pressures from 50 to 2000 P.S.I. . . . in 6 Standard Mountings . . . with or without Adjustable or Self-Regulating Cushions...and a choice of Piston Assembly Types.

GALLAND-HENNING MFG. CO.
2743 SOUTH 31st ST. • MILWAUKEE 46, WIS.
Representatives in Principal Cities

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A-5841-½H-A

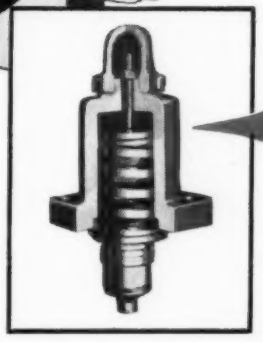
Put ALL of the Oil to Work



Get the Most
OUT OF YOUR CIRCUITS

Top circuit efficiency demands effective regulation of volume and pressure. RACINE Pumps are all equipped with built-in governors — an exclusive RACINE feature. These governors regulate pressure and control the oil flow, delivering *only* the volume needed for the work of the circuit. They "put all of the oil to work." No by-passing — no relief valves — heating is reduced — horsepower conserved.

Governor-controlled RACINE Pumps give you efficiency, flexibility, and economy over a wide range of circuit conditions. Why not review the advantages "Variable Volume" offers for machines in your plant and for your product.



Interchangeable Governor Controls

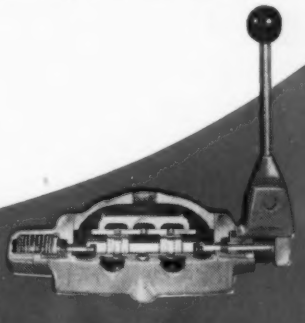
At left is illustrated a standard pressure-compensating governor used in RACINE Pumps. Many other governors, some shown on the variable volume pumps illustrated below, are available for manual, mechanical, hydraulic or electric operation.

With Standard Spring Pressure Compensating Governor

With Manually Operated Volume-Control Governor

With Hydraulically Operated 2-Pressure Governor

With Solenoid Operated 2-Pressure Governor



HYDRAULIC 4-WAY VALVES
A complete line of balanced-piston sleeve-type valves — hydraulically, manually, mechanically or electrically operated — designed to simplify circuits and to meet an extensive range of operating conditions. Available in sizes ⅜" to 1½" IPS.

Write for your copy of our new 3-color Hydraulic Equipment Catalog. Address Racine Tool & Machine Co., 1774 State Street, Racine, Wisconsin.

RACINE
STANDARD FOR QUALITY AND PRECISION

Circle 23 on Reader Service Card

PALMETTO®

Personalizes a Kup's capacity

Regardless of service, Palmetto Kup is always a "special"—ready to be tailored to the performance you specify.

No one packing can be all things to all service conditions. Temperature, pressure, motion, speed, the fluid handled—a variation in any one of these factors at once produces a new situation with which a packing must contend. Accordingly, Palmetto Packing Specialists have avoided "off-the-shelf" answers in filling even standard cup packing needs.

Whatever the service, each Palmetto Kup is built with a "personalized capacity" achieved through use of the one suitable fabric and one proper packing compound that match your application.

THE KUP THAT WON'T CRACK— AND NEVER RUNS DRY!

Fig. 1

Fig. 2

Though the service condition (see above) may suggest other structure, Palmetto Kup ordinarily is constructed as a sandwich. A disc of the prescribed synthetic rubber compound (see Fig. 1) is placed between discs of fabric which have been impregnated with the special compound. When pressure and heat are applied in molding, a complete bonding action takes place, producing a resilient, strong, uniformly reinforced product (see Fig. 2).

Kup will not "dry out" under stress of heat—or from non-use during shutdown periods . . . an important factor in air cylinder design.

Palmetto Kups are stronger at the heel because Kup fabric, cut on the bias, takes shape snugly, does not distort, so retains full strength—eliminates most common cause of failure.

We invite your inquiry. Write for complete details.

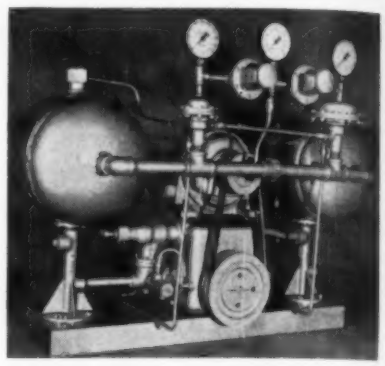
PALMETTO Packings *Specified since 1880*

"WHEN PACKING PERFORMANCE COUNTS"

GREENE, TWEED & CO.

NORTH WALES, PENNSYLVANIA

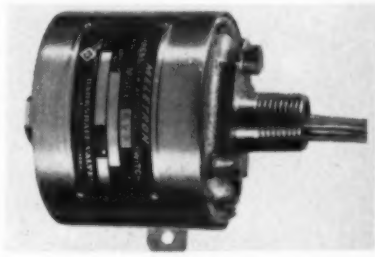
DUAL PRESSURE POWER SOURCE — Simplicity of design and flexibility of control are points claimed by the manufacturer of the new Rialto power source for hydraulic molding presses. Heart of the pumping unit is a unique bypass sleeve, actuated in and out of pumping position by a



snap action regulator control valve. Two separate pumping sections develop individual pressures providing for low pressure rapid advance volume and high pressure liquid for "dwell time". By regulating air pilots both low and high pressures may be individually selected, provided line pressures from 0 to 6000 psi.

Circle 111 on Reader Service Card

DIFFERENTIAL PRESSURE ACTUATED SWITCH — New Meletron 427 pressure actuated switch senses a difference between a variable and reference pressure. Will make or break a circuit at any preset point within the adjustable range on increasing or decreasing



pressure difference. Because the switching element is in contact with the reference pressure air or an inert gas must be used. Six classes of switches provide adjustable ranges from 3 inches of water to 80 psi with proof pressures to 120 psi.

Circle 112 on Reader Service Card

SEALING COMPOUND—A new sealing compound for threaded joints and gasket surfaces known as Leak Lock has been introduced by the Highside Chemicals Company. Leak Lock sets up approximately three times faster than other joint sealing compounds that do not become hard or brittle. This prevents liquids and gases from pushing through the compound before it has set up.

Circle 113 on Reader Service Card

Circle 24 on Reader Service Card

J. I. C. Pneumatic Standards

(Concluded from Page 31)

Storage or Surge Tank Nameplate. Minor clarifying revisions were made in several sub-sections. In the discussion developed on the Cylinder and Piston sub-section, equipment builders protested that the provision "sealing devices that seal with pressure are recommended" would necessitate retooling. As a result this paragraph, A6.3.3, and comparable paragraph on valves, A6.4.3, were held over for fuller discussion at a special meeting held on October 13.

A7 Safety: This section was accepted with only one minor change.

SPECIAL MEETING

The special meeting called to discuss provisions of paragraphs A6.3.3 and A6.4.3 (pressure sealing recommendations for cylinders and valves) met on October 13 in the General Motors Building, Detroit. The meeting was attended by 42 representatives of air equipment manufacturers, packing manufacturers and by a number of major users. As noted previously, considerable objection to these two paragraphs had been expressed at the regular meeting of the J. I. C. Pnuematic Standards group on September 21-22.

The publication of J. I. C. Pneumatic Standards for Industrial Equipment for general distribution is expected early in 1951. It is expected that several manufacturers, as well as one or more major users, will publish copies for customers or supplier use.

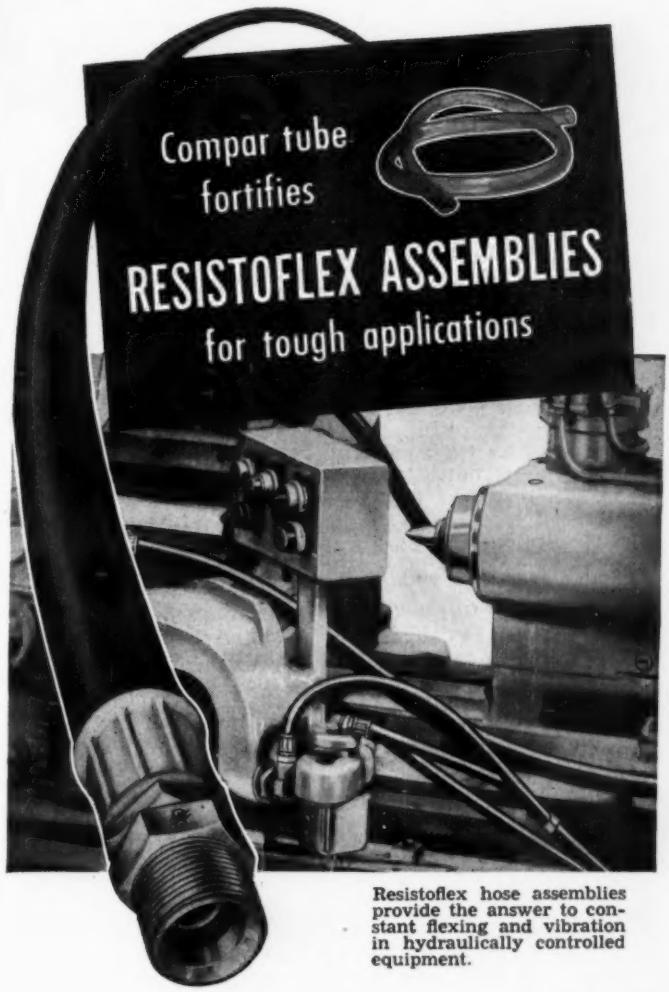
After detailed discussion, during which all who attended were given ample opportunity to express their opinions, the disputed paragraphs were rewritten as follows:

A6.3.3 Ends of the cylinders shall utilize sealing devices that do not leak under manufacturers intended operating conditions. Cylinder external sealing devices shall be readily accessible for servicing.

A6.4.3 When practicable, subplate mounted valves (or equivalent) shall be used so that their replacement can be made without disconnecting individual air lines. Seals of the pressure sealing type or seals of a type that will provide the equivalent of pressure medium sealing type are recommended. Means shall be provided so that subplate mounted valves cannot be improperly assembled to the subplate.

The paragraphs were accepted with the understanding that the use of sealing devices that seal with pressure be further investigated, in preparation for another Joint Industry Conference which will be called in 1951.

Extra Strength in this Oilproof Hose!



Resistoflex hose assemblies provide the answer to constant flexing and vibration in hydraulically controlled equipment.

THREE REASONS explain why more and more manufacturers standardize on Resistoflex Hose Assemblies. These lines, containing no metal reinforcements, have: (1) Superior flexibility and are fatigue-proof. (2) High burst strength for medium as well as low pressure installations. (3) Complete impermeability to oils. All these advantages, of course, add up to fewer service troubles and replacements.

The extra durability of Resistoflex hose is assured by its unique construction. It has the compar tube. This high tensile tube not only reinforces the hose against shock loads, but also helps maintain clean systems because it doesn't swell, gum or erode in contact with oils.

If you have an application involving flow of hydraulic, lubricating or water-insoluble cutting oils, it will pay you to learn more about these light, cost-cutting, compar-tubed lines. Other assemblies available for gases, refrigerants or tough solvents. Write us about your problem, or for more information.

RESISTOFLEX

RESISTOFLEX
CORPORATION

Belleville 9, New Jersey

SYNTHETIC FLEXIBLE PRODUCTS AND PARTS FOR INDUSTRY

Circle 25 on Reader Service Card

Useful Catalogs and Bulletins

available for reference

Control Equipment

Crank Type Cylinders . . . For the answer to many control problems where a rotary motion is required, Bulletin 126 issued by Askania Regulator Company, describes their crank type cylinders. Through precision gearing and crank arm, the linear motion of these air operated cylinders is converted to angular motion for such applications as the control of butterfly valves. Operating on air pressures of 80 to 100 psi, torques as high as 7500 inch pounds may be attained. Performance data and dimensional characteristics are included in this folder.

Circle 114 on Reader Service Card

Magnetic Amplifiers . . . Bulletin 20-A issued by Vickers Electric Division presents a wealth of data for the understanding and application of magnetic amplifiers. Nomenclature, description of components, theory of operation and amplifier circuits are discussed. A section is presented to assist you in the interpretation of data on amplifier bulletins. Installation data and classification charts are included.

Circle 115 on Reader Service Card

Pressure and Float Control . . . The New Duotrol Bulletin 1500 has just been printed by Automatic Control Company. This Bulletin will tell you how to get more water with fewer pump operations from any pressure. It will illustrate how you can use Duotrols with horizontal pump installations or with deep well installations. Handy tables are on the back page, together with typical specifications.

Circle 116 on Reader Service Card

Lever-Type Air Cylinder . . . Erickson Tools Division has issued a design sheet describing their lever-type air cylinder. The mechanical advantages of levers give 3 to 4 times the drawbar force of conventional air cylinders having the same piston area. Piston is of the "donut" design permitting bar stock and work to be passed through the unit.

Circle 117 on Reader Service Card

Pressure Gauges . . . Here are 66 pages describing the complete line of United States Gauge which includes pressure, temperature, flow, level and electrical measuring instruments. A pictorial presentation shows the careful steps of manufacture. Specifications are complete and concise, providing the user with a handy reference for the selection of his gauge requirements.

Circle 118 on Reader Service Card

Industrial Gauges . . . Including Bourdon tube pressure gages to meet hydraulic circuit requirements up to 30,000 psi, Catalog Section 6, prepared by Jas. P. Marsh Corporation, describes their complete line of industrial gauges. Cutaway drawings show construction features of pressure, vacuum, compound, altitude and combination gauges.

Circle 119 on Reader Service Card

Micro Switches . . . Catalog 61A, issued by Micro Switch Division of First Industrial Corporation, presents complete design, technical and application data for their wide variety of switches. Basic types are illustrated and dimensioned. Cutaway drawings clearly show construction features. Die cast enclosed switches, explosion-proof switches and splash-proof switches are described. A section is included giving definition of terms.

Circle 120 on Reader Service Card

System Accessories

Cartridge Filter . . . Designed for the filtration of industrial oils, solvents and water, a small "Pak" filter with 1600 sq. in. filtration area, having a capacity of 600 to 800 gph, is described in a bulletin issued by Alsop Engineering Corporation. Asbestos discs are assembled in cartridge form for easy and quick handling. A handle on top of the filter positively seals the unit against leaks up to 100 psi.

Circle 121 on Reader Service Card

Bonded Seals . . . Franklin C. Wolfe Co., Inc., offers engineering data and specification bulletins to meet individual sealing problems. The Lock O Seal, which is a rubber seal bonded to a metal retainer is available to seal screw sizes from a No. 4 machine screw to a 2 in. diameter bolt.

Circle 122 on Reader Service Card

Compression Fittings . . . Dresser Manufacturing Division announces the availability of a new twelve page catalog which illustrates their complete line of compression fittings for copper tubing and steel pipe. The fittings employ threaded end-nuts, screwing on a threaded body, compressing a gasket to make a flexible, tight seal. Featured in the catalog is a two-page spread which illustrates the twelve specific applications where the fittings give unique performance.

Circle 123 on Reader Service Card

Flexible Hose and Couplings . . . Avica flexible metal pipes with integral angle couplings are illustrated in an available data sheet. These assemblies are custom made in sizes from ⅜ to 1½ in ID. Suitable for oil in medium and high pressure systems where service conditions of vibration and flexing must be met, the integral angle coupling feature simplifies the making of piping layouts and reduces installation time and cost.

Circle 124 on Reader Service Card

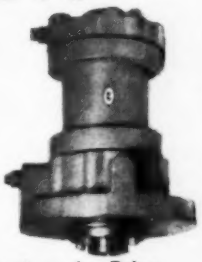
Circle 26 on Reader Service Card

COMPARE —

"POWER-PLUS"

HYDRAULIC CYLINDERS

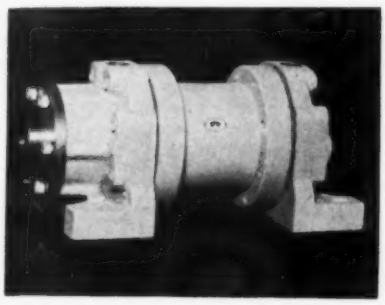
Air — Oil — Water



Seven Standard Mountings
Sturdy! Dependable!
They have Every Improvement

Premium Cylinders at No Premium in Price

Pressures to Meet Your Requirements —



In four Pressure Ranges:

200 p.s.i.
750 p.s.i.
1500 p.s.i.
3000 p.s.i.

Bores from 1" to 24" — Strokes to 18 feet.

Designed and Constructed to J.I.C. Standards

Write for complete information and engineering data

NEPTUNE-POWER PLUS PRODUCTS COMPANY

2228 Bellevue, Detroit 7, Michigan

Roylyn **COUPLINGS** *

- LIGHT WEIGHT
- QUICK CONNECTING
- POSITIVE LOCKING
- HIGH PRESSURE SEAL
- VIBRATION PROOF
- WIDE TEMPERATURE RANGE
- SIZES FROM ¼ INCH TO 6 INCH

IMPORTANT FEATURES

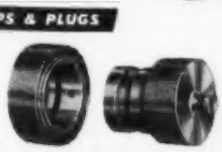
* FOR MANY VARIED INDUSTRIAL USES:

- Railroad Diesel fuel lines
- Marine fuel loading lines
- Tank and Line Pressure Tight Caps
- Processing and Chemical Industries
- Petroleum loading valves and connections
- Liquid transfer and closed hydraulic systems

OPEN COUPLINGS

SELF-SEALING COUPLINGS

CAPS & PLUGS



Features like these mean CONNECT WITH ROYLYN!

★ ***SIZE RANGE*** . . . ¼ inch to 2½ inches. Up to 6 inches in some styles.

★ ***PRESSURE RANGE*** . . . 6600 to 650 P.S.I.

★ ***MATERIALS*** . . . Aluminum alloy, brass, carbon steel, alloy steel and stainless steel.

★ ***OPERATION*** . . . A simple "twist of the wrist"— NO TOOLS REQUIRED!

★ ***POSITIVE LOCK*** . . . Locks with a "snap" and positively will not uncouple with vibration, pressure or rotation of the connected hose.

★ ***SAFETY*** . . . Laboratory tests for extremes of heat, cold, vibration and years of hard service have proven its rugged reliability.

★ ***VERSATILITY*** . . . Open nipple can be used with self-sealing coupling to provide shut-off on one side only. Also open coupling can be used with self-sealing nipple to provide check valve action.

There is a Roylyn Coupling available for practically any type of flexible connection for air, water, hydraulic and chemical applications. Write today for free illustrated catalog and nearest dealer. Inquiries regarding available dealerships are invited.

ROYLYN, Incorporated

714 W. WILSON AVE., GLENDALE 3, CALIF.

Roylyn makes Good Connections for You!

Standardize

ON THE BEST!

ACADIA

HYDRAULIC and PNEUMATIC VEE and CUP

PACKINGS

There is a reason why more and more users of hydraulic packings have come to standardize on ACADIA Vee and Cup Packings. They have learned they are much superior in *over-all* performance. They can depend upon their uniformity. They feel confident that when Acadia Packings go into the product there will be an absolute minimum of complaints from this source. So join the ever-increasing list of builders of equipment who standardize on Acadia Packings. A complete line is available.

Acadia Packings are molded from highest grade synthetic rubber compounds that meet a wide range of applications. Sizes: Vee rings 3-16" i.d. to 24" i.d.: single acting cups available from 5-16" to 15⅜" o.d.: Write for new Acadia Packing booklet giving essential facts about physical properties, designs and applications. Acadia engineers will be happy to cooperate.

ACADIA *Synthetic* **PRODUCTS**

Processors of Synthetic Rubber and Plastics • Sheets • Extrusions Molded Parts

DIVISION WESTERN FELT WORKS

Branch Offices in All Principal Cities • 4035-4117 Ogden Avenue • Chicago 23, Illinois

Circle 27 on Reader Service Card

Circle 28 on Reader Service Card

Hydraulic Couplings . . . Offering a perfect seal when disconnected and minimum restriction when connected, hydraulic couplings produced by Ulrich Manufacturing Co. are described in an available catalog sheet. Featuring a bayonet type slope for positive locking, the couplings are available in ⅜, ½, ¾ and 1 in sizes.

Circle 125 on Reader Service Card

Power Equipment

Electric Motors . . . Here's a handy, up-to-date illustrated index for Reliance Electric & Engineering Company's motors, motor drives, regulators and electronic controls. Bulletin 703 quickly presents a guide for meeting your motor requirements.

Circle 126 on Reader Service Card

Air Cylinder Powered Pump . . . Milton Roy Company offers Bulletin 450 illustrating their "aiROYmetric" pumps which make available controlled volume pumping. Applications include blending systems, feed systems, hydrostatic testing, bottle filling and packaging. Along with cross-sectional drawings showing the construction of these air operated pumps, are circuit diagrams for each of seven applications.

Circle 127 on Reader Service Card

Air Compressors . . . Ten pages of a 52 page catalog offered by the Kellogg Division of American Brake Shoe Co. give you valuable information on "How to Select an Air Compressor and What You Should Know Before You Buy". Single stage and two stage package compressors are described along with necessary valves, fittings and hose. Installation and maintenance procedures are discussed.

Circle 128 on Reader Service Card

Hydraulic Cylinders . . . Presented for the first time in 56 page Catalog H-3, is The Commercial Shearing & Stamping Company's complete standard line of double acting, single acting, telescopic hydraulic cylinders. These units are for heavy duty suitable for operating pressures up to 1500 psi. This three color catalog illustrates the range of sizes and mountings complete with application data.

Circle 129 on Reader Service Card

Fluid Power Package . . . Bulletin PU issued by Simplex Engineering Co. describes a power unit which includes all the components for automatic high and low pressure requirements. The unit is designed primarily for press operation where a high volume, low pressure pump rapidly closes the press and a high pressure pump supplies the final squeeze. All components are clearly illustrated.

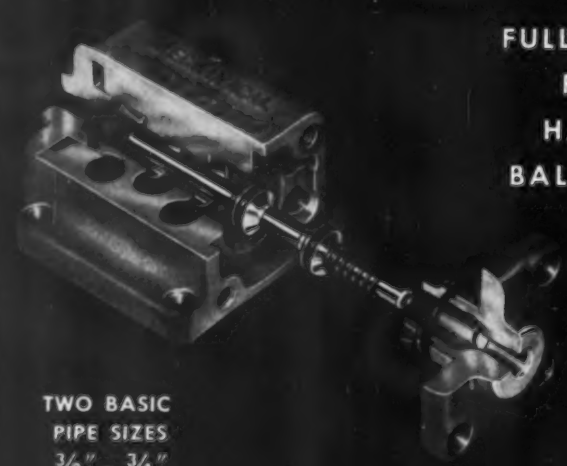
Circle 130 on Reader Service Card

Air Cylinders . . . Condensed Catalog 89 prepared by Cowan Goodridge Standard Company includes seven pages of dimensional drawings for their air cylinders. Available in bores ranging from 1½ to 8 in and mounting styles which include flange, parallel base, clevis and trunnion.

Circle 131 on Reader Service Card

CHOOSE THE AIR VALVE YOU HELPED DESIGN

FOR AIR CYLINDER CONTROL
FULL FLOW • COMPACT • ONE MOVING PART
PRECISION SPOOL AND BORE THAT IS
HARD CHROME PLATED FOR EXTRA LIFE
BALANCED TYPE "AIR PRESSURE SEALED"



TWO BASIC
PIPE SIZES
⅜" - ¾"

MAC
MECHANICAL AIR CONTROLS, INC.
3427 HECLA AVENUE
DETROIT 8, MICHIGAN

CAM VALVE | PILOT CONTROLLED VALVE | FOOT VALVE | DOUBLE SOLENOID VALVE | SOLENOID VALVE | TWO PRESSURE VALVE

Write for Catalogue

Circle 29 on Reader Service Card

SUNVIS H.D. 700 OILS PREVENT AND CURE "THROMBOSIS" IN PRODUCTION MACHINERY

Reduced output and extra maintenance cost are the penalties when clogging occurs in the oil circulating system of machinery. But this costly production ill can be avoided. Sunvis H.D. 700 Oils *keep circulating systems clean*. What's more, if trouble exists now, Sunvis H.D. 700 Oils will *free oil lines and bearings of foreign matter*. They go to work immediately loosening up and carrying away any accumulation of dirt, carbon, water, or other contaminants.

Sunvis H.D. 700 Oils are specially developed for modern circulating systems on machines operating where contamination is a troublesome factor. Sunvis H.D. 700 Oils are extremely stable and have long life even under the most adverse conditions. They have inherent rustproofing characteristics, and the high film strength needed to eliminate scoring on heavily loaded antifriction type bearings.

Sunvis H.D. 700 Oils are also fully detergent, dispersive, and resistant to foaming, and are available in all required viscosities.

For further information about Sunvis H.D. 700 Oils, write for booklet AH-12.

SUN OIL COMPANY • *Philadelphia 3, Pa.*

In Canada: Sun Oil Company, Ltd., Toronto and Montreal

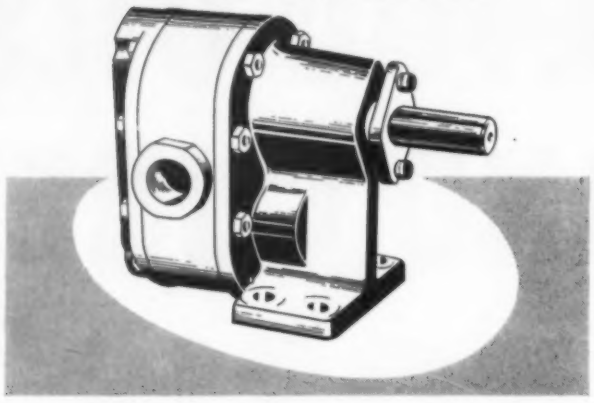
SUN PETROLEUM PRODUCTS

"JOB PROVED" IN EVERY INDUSTRY

SUNOCO®

Circle 30 on Reader Service Card

Circle 31 on Reader Service Card



NEW GEAR PUMP NOW IN PRODUCTION

- For Hydraulic Systems, Chemical & Paint Spraying, Machine Tool Use.
- Tapered Gears Adjust for Diametrical Clearance.
- Floating End Plate for Automatic Take-Up of End Clearance.
- Heavy Cast Iron or Bronze Construction for Durability.
- Ample Bearings for Long Life.

Specialists in Hydraulic and Pneumatic Development

GREAT LAKES MANUFACTURING CORP.

1046 E. 134th STREET • CLEVELAND 10, OHIO

Centrifugal Pumps . . . Economical pumping units for every industry are catalogued in a new 16 page "Handy Guide to Selection of Centrifugal Pumps" released by Allis-Chalmers Manufacturing Company. A wide variety of units are indexed in this bulletin including close-coupled, pedestal, double suction single stage, multi-stage, self-priming, fractional horsepower, coolant and circulating. Head capacity charts and tables for various types of the pumps are given along with data on sizes, capacities and construction features.

Circle 132 on Reader Service Card

Materials and Services

Flexible Hose . . . Just completed by Aeroquip Corporation, Bulletin 113 contains much valuable information in the way of industrial hose and fittings specifications as well as instructions on assembling fittings to hose lines. Also included is detailed information on Aeroquip self-sealing couplings and breakaway couplings.

Circle 133 on Reader Service Card

Hydraulic Oil . . . A new 12 page illustrated booklet describing Sunvis H.D. 700 Oils is now available through Sun Oil Company. It will be of interest to production men in plants where contamination and rust are a problem and where bearings are operating under heavy loads. The booklet describes how these heavy-duty oils perform in circulating and hydraulic systems, compressors, and gear boxes.

Circle 134 on Reader Service Card

"Parco" is a trade name to rely on for better "O" rings. Better because the material used is precision compounded and fabricated by men with years of experience. All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-P-5510 (6290) are available from stock. Silastics, Kel-F, and other special compounds are available on order.

Catalog and engineering data on request. Write us today.

Parco

Plastic and Rubber Products Company

2100 Hyde Park Blvd., Los Angeles 47, Calif.

919 No. Michigan Ave., Chicago, Ill.

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Broach Redesign

(Continued from Page 27)

through the work piece; similarly, an auxiliary slide carries the broaching bar below the level of the work table to facilitate work removal.

Change Cylinder Rod Diameter?

When it was determined where the machine was slow, the first solution considered, naturally, was to increase the diameter of the cylinder rod, reducing the volume required for the main slide return. This model of American broaching machine has the main cylinder body cast as an integral part of the main slide casting. The cylinder rod is stationary and is anchored in the top of the machine column, with drilled passages or cylinder porting to each side of the piston—thus the cylinder slide assembly does the moving. To make a new rod of larger diameter would necessitate drilling two deep holes or cylinder ports an estimated depth of four feet. A new cylinder head and packing gland would also be required. This solution could be accomplished only through dismantling a major portion of the machine to permit the installation of such new parts.

This model broach is equipped with a double vane type pump (one large and on small pumping cartridge) and since a report from our machine repair department informed us that the pump contained maximum volume rings, the installation of a larger pump was next considered.

Add Larger Pump?

With 6 gpm additional required to equal its competitor's performance, it was obvious that the present motor's horse power was inadequate for a larger pump. In addition, since the present pump was flange mounted inside the machine column upon the reservoir inspection cover, the adaptation of a larger motor to the present motor bracket, in lieu of a new motor bracket, would require making a new inspection cover to properly locate a larger pump.

Use Separate Package Power Unit?

The erection of a separate motor-pump power unit along side the machine base was next considered. Such an installation would require the removal of the present power unit as well as some time to erect. Removal of the present unit would necessitate making a new inspection cover, properly drilled and tapped and carrying the new intake and dicharge lines. The question arose as to whether or not sufficient bleed off of the larger volume could be obtained with the present control valve to maintain the present range of feeds. It was almost certain that a new flow control stem, with an increased orifice, would be necessary.

(Concluded on Page 55)

Announcing

ASCO "MIDGET" SIZE TWO-WAY AND THREE-WAY SOLENOID VALVES

This is the new small ASCO Two-Way Solenoid Valve . . . only 2-13/16" from the top of the solenoid housing to the bottom of the valve body. The Three-Way Valve or the Two-Way Valve designed for Normal Open Operation is only slightly larger, being only 3-5/16" from top to bottom. (The latter valve is the lower picture.)

These Midget Two-Way and Three-Way Valves have many applications in the control field because of their compactness, sturdiness and efficiency. The Two-Way Valve comes in two pipe sizes: 1/8" and 1/4" Normally Closed (closed when de-energized) and 1/8" Normally Open (open when de-energized). The Three-Way Valve comes in one pipe size only: 1/8". Both are standard in brass or stainless steel. Permissible pressures: Two-Way Valves up to 300 lbs./sq. in. (AC) and up to 250 lbs./sq. in. (DC); Three-Way Valves up to 125 lbs./sq. in. (AC) and up to 50 lbs./sq. in. (DC). Adjustable Main Flow and By-Pass Flow available for Two-Way Valves. Twenty-Four inch (24") leads.

If you have been looking for a really small and really efficient solenoid valve, one of these two ASCO Midget Valves may be just what you need. We'll be glad to send you complete information (Bulletins 8262 and 8314) but in writing will you tell us something about your requirements?

These valves will be exhibited in Booth 550-551 at the New York Power Show, November 27th to December 2nd.

ASCO Solenoid VALVES

When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

Automatic Switch Co.

385-H LAKESIDE AVENUE · ORANGE, NEW JERSEY

AT LAST!

A Two-Way D. C. Poppet-Type Solenoid Valve That's Engineered to Meet Heavy-Duty... Constant Service Requirements

SIMPLE in design — and engineered to meet heavy-duty . . . constant service requirements — the new Electrol Two-Way D. C. Poppet-Type Solenoid Valve is winning wide acceptance among design engineers, who are aiming to improve a product and lower its operating cost.

It is available in either normally open or normally closed types, and can be used in oil, air or water, with pressures up to 1500 P.S.I. The Solenoid is designed to withstand constant energizing, and is obtainable in voltage increments ranging from 6 to 220-volts D. C.

The Valve is of the Poppet Type to assure an absolute minimum of internal leakage. It uses standard hydraulic packings, and has two ½" NPT ports, with a maximum rated flow of 5½ gallons per minute. Reducing bushings are supplied where NPT ports of ⅜", ¼", or ⅛" are required.

The Valve measures 8-3/32" x 3½" x 3", weighs approximately 10 lbs., and has two mounting bosses with holes which will accept ¼" bolts.

When ordering — specify maximum operating pressure, type of fluid used, voltage, port size, the flow required in gallons per minute, and whether the Valve is to be normally open or normally closed.

Our engineers will be glad to work with you in adapting this unit to meet your specific requirement — or on any problem involving the use of hydraulic devices.

Better Designed Products Use Electrol Hydraulics

Electrol

INCORPORATED

KINGSTON, NEW YORK

CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES
CHECK VALVES • RELIEF VALVES • HAND PUMPS
POWERPAKS • LANDING GEAR OLEOS • SOLENOID
VALVES • ON-OFF VALVES • SERVO CYLINDERS • TRANSFER
VALVES • CUT-OUT VALVES • SPEED CONTROL VALVES

FOR BETTER HYDRAULIC DEVICES

Since the required additional volume was required during only a portion of the cycle, the addition of a small unit with valves arranged so that its volume would be available when needed was next considered.

Valve Permits Use of Volumes from Both Pumps

During the fifth part of the cycle it was noted that small pump AA was doing no work. Here was a source of additional volume, more than enough to bring the return stroke of the main ram to the speed of the competitive machine. It was decided, if possible and practical, to utilize this volume. A check on the required pressure to return the main slide revealed that the present motor has sufficient power. Therefore, the installation of a pilot operated, spring offset, four-way directional control valve in the secondary circuit, just ahead of control valve EE, would provide a means of combining the volumes of large pump A and small pump AA during this part of the cycle. The position of this valve, T, is shown in Figure 1.

A standard pilot-operated, four-way directional control valve with needle adjustments to control the speed of the spool shift was altered to provide pilot operation in one direction, with spring return in the opposite. To do this required making one new end cap bored to take part of a spring, the spring being a standard part used in a directly operated sequence valve of the same manufacturer. The length of spring used required approximately 75 psi to shift the spool. The end cap was provided with a drain connection and a bore sufficiently small to serve as a guide and support for the spring, Figure 1. The needle was set low enough to prevent the spring from snapping the valve spool against the end cap. The tank port of the valve was plugged.

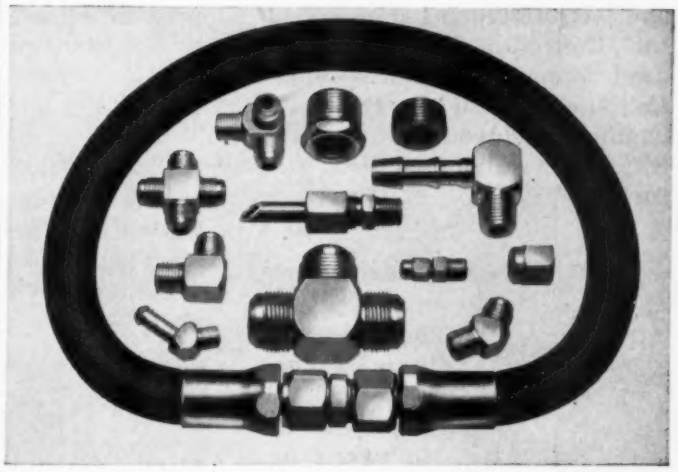
The location for mounting the valve was selected and the mounting holes transferred to the outside of the machine column. These holes were drilled from the outside and tapped from the inside; studs were driven and the valve mounted inside the machine column. The return line from cylinder G to control valve C, containing foot valve D, was removed from the machine. Since this line was constructed of extra heavy pipe and fittings, a boss for the connection of the pilot line was welded ahead of foot valve D and a boss for the connection of the additional supply line was welded to another section of this pipe after the foot valve D. These bosses were drilled and tapped; the pipe reassembled and returned to the machine.

By welding bosses to the original pipe, no new pipe was needed, eliminating pipe threading and fitting. The necessary tubing and fittings to complete the change were installed. Work done at the machine was completed with approximately 10 hours idle machine time. This provided a simple and efficient solution to the problem.

WHEN YOU CHANGE TO

J.I.C. Standards

LET L & L SERVE YOUR HYDRAULIC PIPING NEEDS



- **STEEL TUBE COUPLINGS**

  for ⅛th to 2 inch O.D. tubing
  2 PIECE TITE-SEAL FOR ECONOMY
  3 PIECE LOCK-JOINT-SLEEVE TYPE

- **HOSE ASSEMBLIES**

  with pressed-on coupling for single and double wire braid hose

- **PIPE FITTINGS**

  Straights, Ells and Tees with "Dryseal" pipe threads (N.P.T.F.)

- **PRE-FABRICATING TUBES**

  Let us estimate your preformed tube assembly needs.

• Your installation problems are solicited. Write for catalog and technical data. We also have technical and sales representatives in your area for your convenience. All standard items are shipped from stock the same day your order is received. Excellent service on "Specials".
A few select territories are still available to progressive distributors of Hydraulic equipment—Inquiries invited.

Hydraulic Accessories

L & L Manufacturing Co.

8088 EAST NINE MILE RD. VAN DYKE, MICH.

Circle 35 on Reader Service Card

POST SCRIPTS OF INDUSTRY

NEWS · VIEWS · TRENDS

Formerly **Goshen Rubber and Manufacturing Company, Inc.**, the company has changed their name to **Goshen Rubber Co., Inc.** There are no other changes involved, the organization remaining exactly as before.

R. H. McPeake has been appointed sales manager of **The Aldrich Pump Company**, Allentown, Pa. McPeake, a graduate of the U. S. Naval Academy, had eight years of oil field experience with Standard Oil of New Jersey in both the Mid-Continent and Peruvian fields. In 1938, he left Standard Oil to join The Oil Well Supply Company where he became export sales manager. In 1942, McPeake joined the Navy and served for three years, after which he became a partner in an industrial engineering and importing firm in Buenos Aires, representing American manufacturers.

R. H. McPeake

The Twin Disc Clutch Company, Racine, Wisconsin, announces the appointment of **Paul W. Wahler** as service manager and **Robert A. Harmon** as dealer sales supervisor.

D. W. Holmes, for four years general sales manager of **The Parker Appliance Co.**, has been elected vice president in charge of sales. Holmes, a graduate of the University of Michigan, came to Parker from the Weatherhead Co., where he held the successive posts of assistant to the president, general manager of the Columbia City, Ind., plant, and sales manager.

Richard M. Friddle and **Richard A. Frazee** have been assigned to **Allis-Chalmers** Cleveland and St. Louis district offices respectively as sales representatives.

Geroter May Corporation announces the election of **J. N. Schiavetti** as vice president in charge of production. Schiavetti, formerly the purchasing agent, has been in charge of its manufacturing since 1948. He has been associated with Gerotor May for fifteen years.

Harold K. Beck has been appointed commercial vice president, in addition to his present post as manager of the Washington office of **Worthington Pump and Machinery Corporation**, according to an announcement by W. H. Feldmann, vice president in charge of sales.

SPECIFY LINDBERG AIR CYLINDERS

for
PULLING
PUSHING
LIFTING
FORCING
CLAMPING
PRESSING

No costly mechanisms needed!

Lindberg Double Acting Air Cylinders are proving their adaptability and worth in a wide variety of industrial uses. These simple, dependable, efficient and versatile cylinders are effecting considerable savings throughout industry by the reduction or complete elimination of costly mechanisms involving cams, gear drives and complicated set-ups.

Don't forget—with slight modifications, any size or model of Lindberg Air Cylinder may be used for low pressure hydraulic applications.

WRITE FOR NEW BULLETIN 731—this 16 page catalog just off the press gives details of all standard Lindberg Air Cylinder models and sizes with complete tables on bores, pressures, weights, mountings and conversion to low pressure hydraulics.

Remember—BULLETIN 731 for COMPLETE DETAILS ON AIR CYLINDERS

LINDBERG
AIR & HYDRAULIC CYLINDERS

Lindberg Engineering Company
2441 West Hubbard Street Chicago 12, Illinois

Specify Lindberg
when you need HYDRAULIC CYLINDERS
OIL HYDRAULIC PUMPING UNITS
MILL TYPE CYLINDERS • CENTRIFUGAL
BLOWERS • AIR VALVES

The appointment of **J. W. Fauver**, as vice president of the **J. N. Fauver Company, Inc.**, Detroit, is announced by John N. Fauver, president. Fauver graduated from the University of Michigan in 1943 where he received his degree in Mechanical Engineering. He served the following three years as Captain in the Army Ordnance. His experience during the past four years has been that of sales engineer with the J. N. Fauver Company.

J. N. Fauver

Aircraft Division, Westinghouse Air Brake Company, is extending its field and service representation in the recognized aircraft centers. Field assignments are: **H. W. McCracken,** New York; **D. R. Read,** Dallas; **D. S. Permar,** Cincinnati; **E. L. Holbrook,** Washington; **J. F. Graham,** Los Angeles; and **R. K. Whittlesey,** Seattle.

The **Hammel Dahl Company** announce the appointments of **John O. Tragard** as vice president in charge of sales and contracts and **Maurice MacDonald** as vice president and manager of engineering.

Austin C. Ross, manager of the Buffalo works of **Worthington Pump and Machinery Corporation,** has been elected a vice president of that company. He will continue to serve as Buffalo Works manager.

Addition

H. C. Matheis, whose article "How to Choose the Proper Packing" appeared in the September issue, is associated with E. F. Houghton & Co.

N. A. Gaboriault, president of the **Techniflex Corporation,** Port Jervis, N. Y., announces the appointment of **Joseph Askin** as chief engineer.

Price M. Davis, Jr., Milwaukee has been appointed factory representative for Michigan, Eastern North Dakota and Eastern South Dakota by **Hose Accessories Company,** manufacturers of the LE-HI line of hose couplings. Davis will also contnue to cover Minnesota, Wisconsin, Northern Illinois and Northern Indiana.

The Aro Equipment Corporation has acquired the business and assets of The Taylor Machine Company, Cleveland. Aro aircraft accessories, formerly manufactured at the main plant in Bryan, Ohio, will be produced at the new plant to be known as **The Aro Equipment Corporation Aircraft Division.**

NOW OVER 175

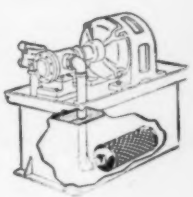
Manufacturers Make

MARVEL SYNCLINAL FILTERS

Their O.E.M. Choice

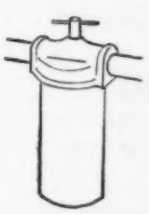
For HYDRAULIC EQUIPMENT where oil MUST BE CLEAN

SUMP TYPE (Cutaway)

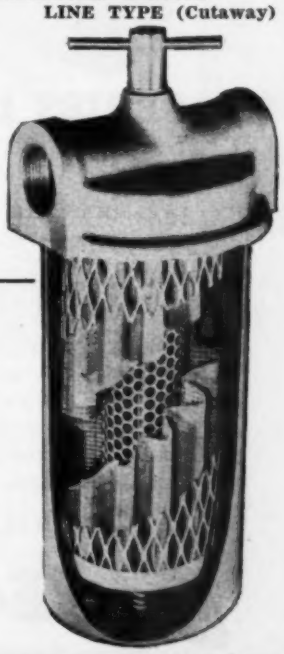


EFFICIENCY—Marvel Synclinal Filters give more filtering area than like size circular units. Preferred by maintenance men because larger filtering area extends periods of operations between cleanings.

SIMPLICITY—Marvel Synclinal Filters may be disassembled, cleaned and reassembled in minutes. A single handnut releases the line model housing without disturbing pipe fittings.



LINE TYPE (Cutaway)



ADAPTABILITY—Marvel Synclinal Filters operate at full efficiency in any position and can be installed at any angle convenient to your machine. Wire mesh sizes from 30 to 200 available. Individual capacities of from 5 to 50 g.p.m. and greater capacities are obtainable by multiple installations.

★

For efficient filtration of liquids in all HYDRAULIC or LOW PRESSURE circulating systems. Marvel has your answer. Write for catalogs 104 and 202.

★ ★

MARVEL ENGINEERING COMPANY

625 W. Jackson Blvd. Chicago 6, Ill.

PLENTY of POWER

IN THESE HYDRAULIC PUMPS and FLUID MOTORS

There's plenty of power in Eastern fluid motors and hydraulic pumps. They're tough and compact—ideal where space is at a premium. They're dependable, too. Long life under rugged operating conditions is built-in. An Eastern hydraulic pump or fluid motor in your design is good engineering.

SERIES 100

.1 to 5 GPM—Drive speeds up to 3450 RPM. Working pressures up to 1000 PSI. Average volumetric efficiency: 90%. Average model weight: 1.65 lbs.

Lightweight construction is obtained through use of aluminum housings and nitralloy gears and shafts. Each unit is factory pre-tested for precision and operating efficiency.

WRITE FOR FULL DETAILS

Eastern

INDUSTRIES, INC.

298 ELM STREET

NEW HAVEN 6, CONNECTICUT

Basic Hydraulics Questions, Chapter 7

1. Distinguish between spool and rotary type directional valves.
2. Why are the spools of directional valves grooved around their circumference?
3. How can a four-way directional valve be used to drive the work piston back and forth?
4. Distinguish between closed and open center directional valves.
5. How are open center spool valves kept in hydraulic balance?
6. Explain how a follower valve can hold a work operation in neutral at any point in the operation.
7. What is meant by a metering valve?
8. Describe the action of a time delay valve.
9. What is the purpose of a prefill valve?
10. What is a valve block? What are panels?
11. In what ways are valves operated?

Main - Ten - Ends

REDUCE PRODUCTION COSTS

End 5. Use the best hydraulic oil, keep it in good condition, change it as often as necessary. Use proper filters.

Seventy percent of the causes for hydraulic service can be traced to the condition of the oil. This 70 percent includes:

1. Excessive wear due to dirty and abrasive oil.
2. Improper type of oil.
3. Rust resulting from condensation or from using an oil with high water affinity.
4. Sludge and lint plugging lines.

Grit and dust drawn into the system; metal particles, deteriorating paint or sealing components within the circuit and changes in the oil resulting from long use or extreme operating conditions are the principle factors in oil contamination.

It is economical to fix leaks and use good hydraulic oil.

Filter new oil before placing it in the system.

Check the condition of the oil frequently.

Flush the system when sludge is present.

THE MARKET PLACE

CLASSIFIED ADVERTISING

Rates: For "Positions Wanted" $4.00 minimum, limit 25 words. For all other classifications $4.50 minimum for 25 words, each additional word 15c; bold face type or all capitals, $7.50 minimum for 25 words, each additional word 20c; limit 50 words. Box addresses count as five words.

Excellent Opportunity — Junior hydraulics engineer to assist chief hydraulic engineer with large manufacturer of tractor equipment and heavy excavating machinery. State fully educational background and experience, draft status, and salary expected. Location southwestern Wisconsin. Write Box 12250 APPLIED HYDRAULICS.

Engineering sales representatives wanted in principal cities to handle complete, quality line of air and hydraulic cylinders. Write in confidence, stating lines now being handled, territory covered and references. Address Box 12150 APPLIED HYDRAULICS.

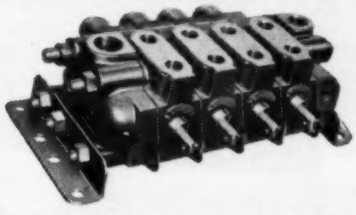
Lull Traveloader

Lull Shoveloader

MORE Cost-Cutting APPLICATIONS OF VICKERS HYDRAULICS

Vickers Hydraulic Equipment plays an important part in the performance records that are being reported on these two popular types of materials handling machines. Illustrated below are representative Vickers units used by Lull . . . all are built especially for mobile equipment. These hydraulic controls offer many advantages to both the equipment user and the manufacturer. They assure quick and accurate response to the operator with negligible physical effort . . . they provide inherent overload protection against abuse of equipment . . . they simplify design and save space. Ask the nearest Vickers Application Engineer to call for a discussion of your product improvement problems.

Vickers Steering Booster provides hydraulic power instantly (with no more effort than a "trigger pull") to meet any steering requirement for better maneuverability of loaders with heavy loads on steering axle.



Vickers Multiple Unit Valves consist of individual operating valve sections, assembled in almost any combination (up to 10 sections) for various hydraulic control functions. Vickers exclusive porting arrangement and fully balanced design provides sensitive positioning under actual operating conditions . . . unaffected by surges.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1474 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • MILWAUKEE NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

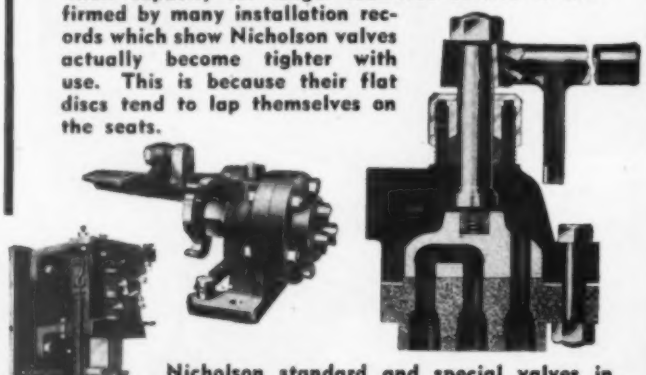
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Circle 41 on Reader Service Card

Nicholson Control Valves

SET RECORDS for LONG LIFE

In a wide range of plants — steel, metal working, processing, etc — Nicholson cylinder control valves have now been in constant use for over 25 years. Their capacity for longer leak-free service is confirmed by many installation records which show Nicholson valves actually become tighter with use. This is because their flat discs tend to lap themselves on the seats.

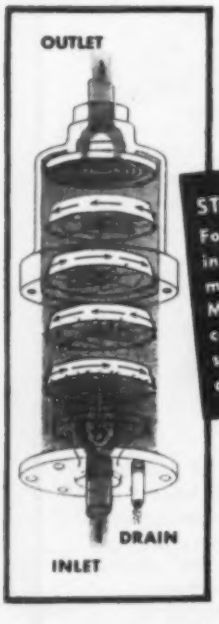


Nicholson standard and special valves in lever, foot, solenoid, motor types; for air, gas, oil, steam, water; size ¼" to 2½"; pressure to 5,000 lbs. CATALOG 546-A

W. H. NICHOLSON & CO. 213 OREGON ST. WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

Why does an ARIDIFIER



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Aircraft Pump Committee

SAE COMMITTEE A-1, AIRCRAFT PUMPS, WAS called to order by Chairman J. Milton Kidd of The Glenn L. Martin Co. at the Hollywood Roosevelt Hotel, Hollywood, California on Tuesday morning, October 3rd. Approximately 35 committee members and invited engineers from industry and government sat in on the full day session.

Fixed Displacement Pumps: Several changes were recommended for specification AN-P-11, covering fixed displacement pumps. These included a change in the method for testing shaft seals to insure a more positive operating margin. This change was recommended after several aircraft representatives reported that more pumps were removed because of shaft seal leakage than for any other single cause. The change involved subjecting the external shaft seal chamber to a reduced pressure, while the internal chamber is subjected to the normal supercharge pressure, in this way increasing the pressure differential across the seal in the same manner as the condition encountered during high altitude operation.

Roger Horton of Hamilton Standard presented a proposed specification for high speed hydraulic pumps to cover several types now being developed. Pumps in this class are designed to operate at a rated speed of 8250 rpm. The committe reviewed the specification and made a number of changes. Mr. Horton agreed to revise the document in accordance with these agreements and to recirculate the revised specification to the committee members.

Variable Delivery Pumps: Also under discussion was the new and as yet unreleased specification for variable delivery pumps. Carl L. Sadler of Sundstrand Machine Tool Co. proposed a change in the cold start requirements which would increase the time for accelerating the pump up to full speed. This new schedule, divided into three steps, was designed to simulate the cycle encountered in cold starts of aircraft engines. This cycle requires alterations in the case of electrically driven pumps. This same change was also recommended for fixed displacement pumps. A set of tests was also proposed for both specifications, designed to determine the pressure pulsation characteristics of the pumps. Various pump manufacturers have indicated that they would test their products in accordance with this method and report on the practicability of the established procedure.

Circle 40 on Reader Service Card

Minor changes were also made to the new specification for hydraulic motors. Discussion on other items included Air Turbines, Quick Attach-Detach Connections for Pumps and Accessories and Vibration Considerations for Engine Mounted Pumps.

Chairman Kidd reported on the activities of his committee at the A-6 meeting.

Fittings Committee

THE FALL MEETING OF SAE COMMITTEE A-3, Aircraft Valves, Fittings and Flexible hose assemblies was held on October 2nd at the Hollywood Roosevelt Hotel, Hollywood, California. Chairman Les J. Henderson of The Weatherhead Company presided over the one day session.

Forged and Extruded Aluminum Fittings: Among the seventeen items on the agenda were several which have been causing serious concern to those aircraft manufacturers now using 3000 psi hydraulic systems. At the last meeting in April at New York, it had been reported that the new series of female boss fittings made from forged aluminum alloy had failed to pass the necessary impulse tests and that steel fittings would have to be used until another solution could be found. R. W. Phillips of The Weatherhead Company reported on further tests on fittings made from aluminum alloy extruded stock

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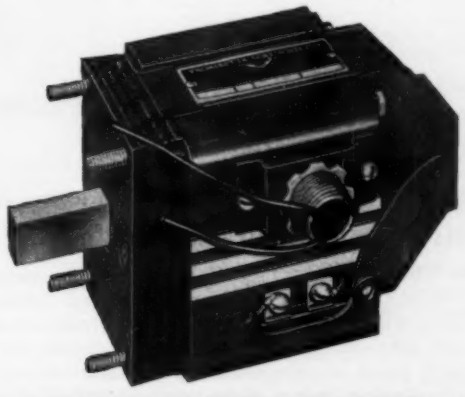

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and indicated that, while these fittings were better than the forged parts, they were still far from satisfactory. The discussion pointed out that further tests should be made on parts made from plate stock and that some study should be made on the gains to be derived from machining an internal radius at the intersection of the cross drilled holes.

Some revisions were made to the requirements for use of the AN 819 flared fitting sleeves. Under the new specifications, only steel sleeves may be used with steel tubing. Either aluminum alloy or aluminum bronze sleeves may be used with aluminum alloy tubing, or steel sleeves may be used in sizes -8 and larger if desired.

Status of Large Diameter Tube Fittings: Another item held over from the previous meeting was the subject of standardization on large diameter tube fittings. A survey was made through the airframe manufacturers to determine their requirements for such parts. The survey revealed that it would be useless to attempt standardization at this time. However, the survey did bring out much useful information which can be utilized by the fitting designers in preparing designs to meet aircraft manufacturers requirements.

Chairman Henderson made a report of the A-3 activities at the A-6 meeting.

See SAE A-6 Meeting report on page 36.

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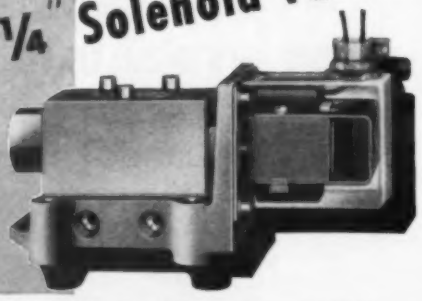

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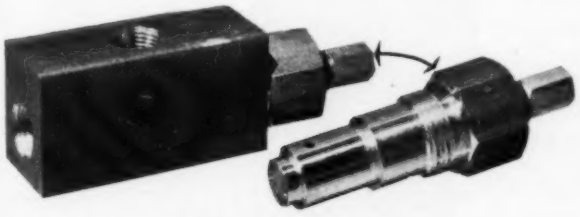

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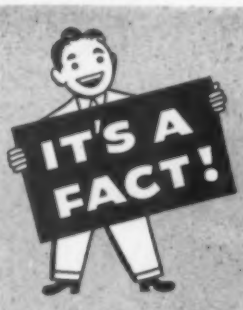
ADVERTISERS INDEX

DECEMBER, 1950

Aeroquip Corporation ---- Cover II
Aldrich Pump Co. ---- 18
American Crucible Products Co., The ---- 64
Anchor Coupling Co. ---- 17
Automatic Switch Co. ---- 53
Chicago Rawhide Mfg. Co. ---- 16
Commercial Shearing & Stamping Co., The ---- 41
Eastern Industries, Inc. ---- 58
Eaton Manufacturing Co. ---- 9
Electrol Incorporated ---- 54
Fluid Controls, Inc. ---- 63
Galland-Henning Mfg. Co. ---- 44
General Filters, Inc. ---- 8
Great Lakes Mfg. Co. ---- 52
Greene-Tweed & Co. ---- 46
Greer Hydraulics, Inc. ---- 13
Hannifin Corporation ---- 14
Harrison Radiator Div., General Motors Corporation ---- 6
C. B. Hunt & Son ---- 62
James-Pond-Clark ---- 61
Johns-Manville ---- 19
Lindberg Engineering Co. ---- 56
Linear, Inc. ---- 15
Logan Engineering Co. ---- 60
Logansport Machine Co. ---- 43
L & L Mfg. Co. ---- 55
M-B Products ---- 62
Marvel Engineering Co. ---- 57
Mechanical Air Controls, Inc. ---- 50
Miller Motor Co. ---- 10, 11
Neptune-Power Plus Products Co. ---- 49
W. H. Nicholson & Co. ---- 60
Oilgear Co., The ---- 3
Palley Supply Co. ---- 62
Pesco Products Div., Borg-Warner Corp. ---- Cover III
Petch Manufacturing Co. ---- 63
Plastic & Rubber Products Co. ---- 52
Precision Rubber Products Corporation ---- 7
Racine Tool & Machine Co. ---- 45
Raybestos-Manhattan, Inc. ---- 12
Resistoflex Corporation ---- 47
Ross Operating Valve Co. ---- 1
Roylyn, Inc. ---- 49
Standard Pressed Steel Co. ---- 64
Sun Oil Company ---- 51
Texas Company, The ---- 20
Trombetta Solenoid Co. ---- 61
Valvair Corporation ---- 63
Vickers Incorporated ---- 59
Waterman Engineering Co. ---- 44
Weatherhead Company, The ---- 4, 5
Wegner Machinery Corp. ---- 64
Western Felt Works ---- 49
Yarnell-Waring Co. ---- 61



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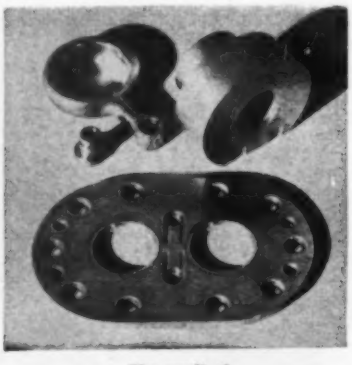

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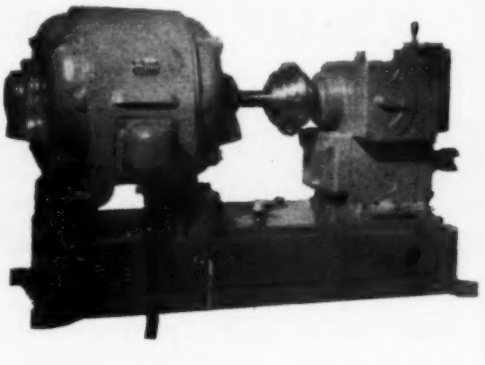

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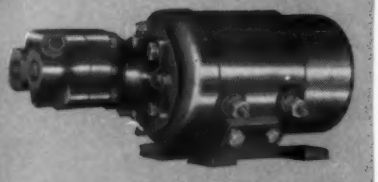

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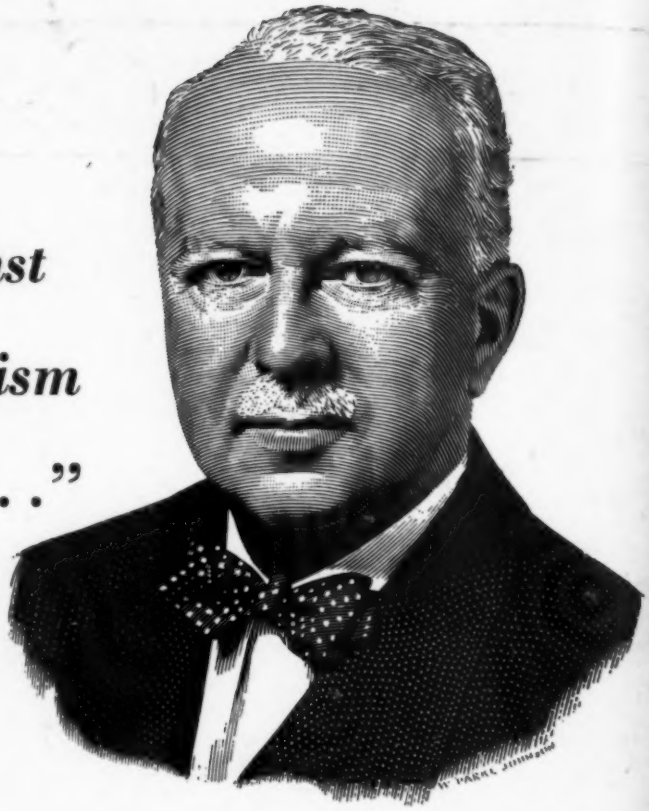

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